PARTICLE DETECTORS

HST2026 Study Group 8

Key Ideas

Showcase the most important aspects of the topic that you consider to be key for a meaningful instruction

- ‘Observing’ these particles takes us back to the **Big Bang**!
- We see **effects** of particles, not the particles themselves
- Different **parts** detect different particles by measuring different effects
- Different results every time. **Big data** shows the existence of a particle

Curriculum & Classroom Connections

Highlight potential connections to the various curriculums and your individual teaching practices

- **Lorentz force**
  - Students learn about path of charged particles in magnetic fields
  - Give them the challenge of identifying particles in a detector based on their path!
- **Making scientific inferences**
  - “Can we see electrons?”
  - Show students that ‘seeing’ is not the only way of observing
  - Can use this to teach the skill of inferring from observations at younger ages

Potential Students' Conceptions & Challenges

Illustrate elements of the topic that might obstruct a successful introduction in the classroom

Scientific idea	**Student misconception/challenge**	**Useful analogy/tool for helping students**
We make inferences about particles based on the path	"We see particles"	You see footprints in the snow and use them to infer properties of the animal
Statistical analysis shows the existence of a particle	Interpreting graphs is a big challenge in the classroom Students may think one unusual event proves a hypothesis	Novak Djokovic has only won 54% of the points he has played. This 'small' difference proves he is the best!
Collisions produce many products. There are no 'balls' breaking into pieces	Student imagine a collision as balls smashing together and breaking into pieces	Two strawberries collide and make a banana, a fridge, and an elephant!

Useful Material & Resources

Reference any material that you find useful for your students and/or your colleagues

Two amazing tools (links in notes)

HYPATIA

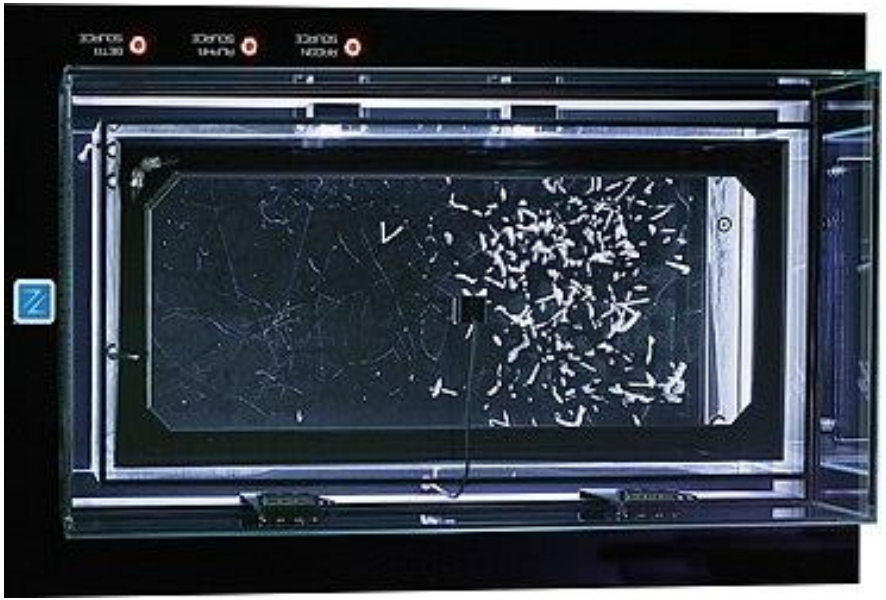
- Students can examine graphic visualisations of collisions produced by ATLAS
- Example: distinguish tracks from muons and electrons

PHET

- Rutherford scattering simulation
- Shows how the deflection of alpha particles supported Rutherford’s model

Best Practice Example

Summarise your findings through a brief outline of an instructional strategy



Cloud chamber

1. Prediction: what do you expect to see?
2. Explanation: why do you expect to see these paths?
3. Observation: build cloud chamber. Observe and classify paths
4. Comparison: compare observations to video of CERN's cloud chamber
5. Explanation: why do these different paths appear in the cloud chamber?
6. Reflection: what are the limitations of the cloud chamber?

HST2026 Study Group 8

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One way in which our thinking has changed…

When we learned in school:

Science = knowledge

What we would like to teach:

Science = experience + process = knowledge

Highlights, snapshots, farewell messages…

- Passionate presenters
- Best HST group ever

Question: can we stay here for another week (if we promise we will be on time for everything)?