

## Slide 1 — Early particle detectors

"Actually, detecting such tiny particles is not easy at all.

Early particle detection used very simple gas devices. Ionization chambers and Geiger counters could detect charged particles. basically, they tell us that *something* passed through.

The same principle is even used in our daily life now in some types of smoke detectors !

But maybe the most famous early detector was **Wilson's cloud chamber**.

In this device, charged particles flying through chamber leave visible trails — kind of like airplane contrails in the sky. By looking at these tracks, we can see where the particle went.

Over the years, these detectors improved a lot, but they also faced big limitations.

So a natural question arose: **how can we get more particles, and more information about them?**"

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## Slide 2 — Colliders

"To get a stable and strong source of high-energy particles, the best way is to **collide particles at high speed**.

That's where **particle accelerators** come in.

Today, several major colliders operate around the world, each with a different purpose.

In Japan, there's **SuperKEKB**, and in China, **BEPC**.

In Europe, we have the **Large Hadron Collider**, or LHC — the most powerful accelerator ever built: the LHC is **26 kilometers in circumference** — a huge underground ring! It's truly a giant scientific machine."

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## Slide 3 — Particle detectors

"Besides powerful colliders, we also need **high-performance detectors** to record what happens inside collisions.

A modern detector is a very complex system — layer after layer, and each layer has its own job.

By the way, if you've watched *The Three-Body Problem* TV series, one of the shooting locations was actually inside **BEPC in Beijing**.

Anyway, you don't need to remember all the technical details — just know that **these detectors are really cool.**"

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## Slide 4 — The LHC and Higgs search

"So why do we build such gigantic machines?

The answer is: to search for the **missing piece of the Standard Model** — the **Higgs boson**.

The Higgs was discovered right here at the **LHC**.

There are four main detectors on the LHC ring: **CMS, ATLAS, LHCb, and ALICE**.

Each one was designed with a different physics goal in mind.

The Higgs boson was detected independently by **ATLAS** and **CMS**, the two general-purpose experiments."

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## Slide 5 — The discovery moment

"Here are two pictures from **July 4th, 2012**, when CERN officially announced the discovery of the Higgs boson.

It was a historic moment — the confirmation of the last missing piece of the Standard Model.

And there's a lovely little story behind this photo.

The physicist **Sau Lan Wu**, who had worked on Higgs searches, met **Peter Higgs** himself and said:

'I've been looking for you for more than twenty years.'

And Higgs replied, smiling:

'Well, now you've found me.'

On the right is the scene when the speaker finally said the word "Discovery!"."

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## Slide 6 — What's next & summary for the whole group

"The discovery of the Higgs boson confirmed that the **Standard Model** is remarkably accurate — it explains almost everything we can measure about fundamental particles.

But, of course, science never stops there.

We still have many unanswered questions — things like **dark matter**, **neutrino masses**, and **why gravity is so weak** compared to other forces.

These mysteries hint that there's **physics beyond the Standard Model** waiting to be found.

So, to quickly wrap up our whole presentation with one sentence — **theory gives us the questions, experiments give us the answers.**

And together, they bring us closer to understanding how our universe truly works.

Thank you very much!"