New educational activity about CMS air pads for education labs at CERN Science Gateway

Patrick Thill, Sascha Schmeling, Julia Woithe

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CERN Science Gateway

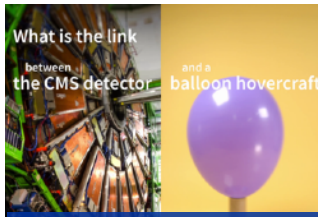
CERN's new flagship project for science education and outreach, opening in 2023

Exhibitions

Guided tours

Science Shows

Lab Workshops



Learn Online

Events

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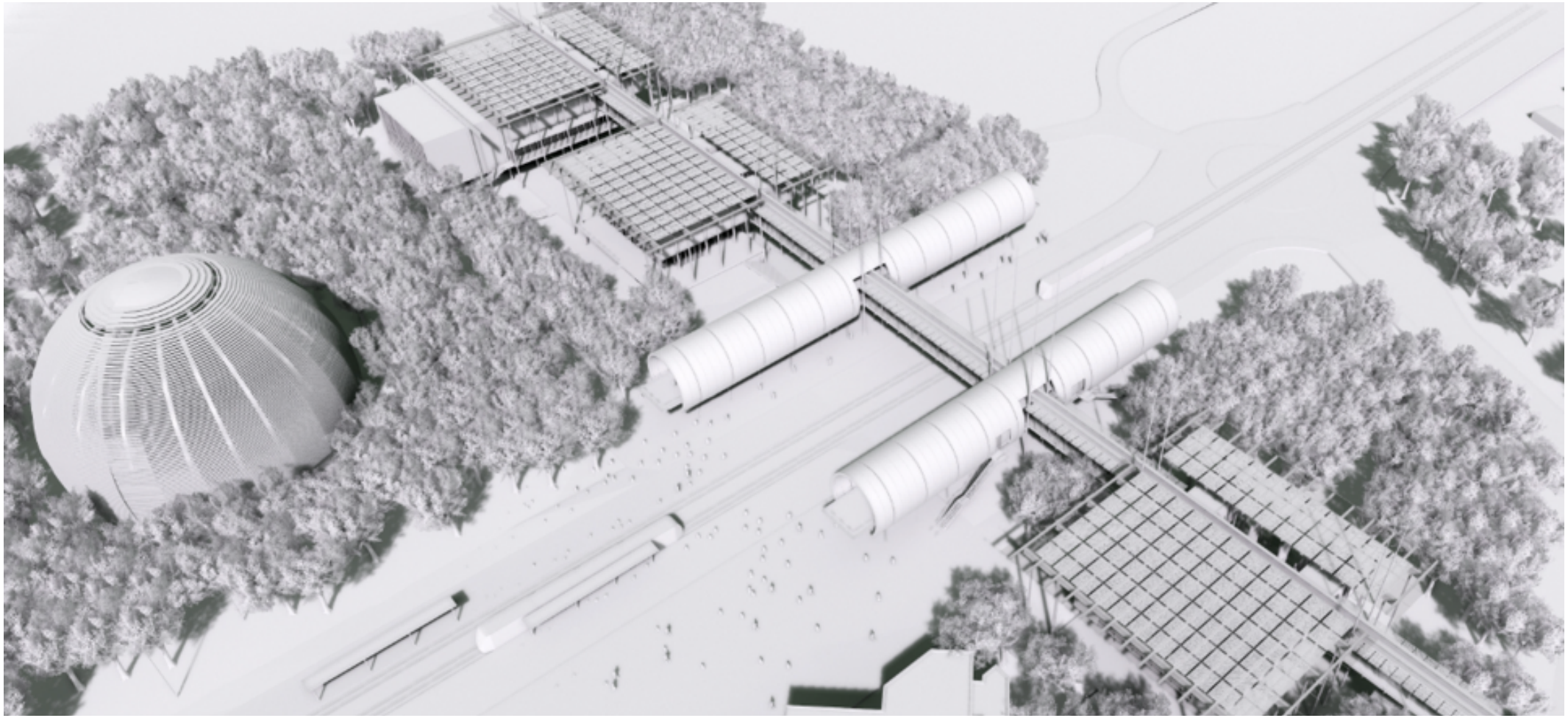

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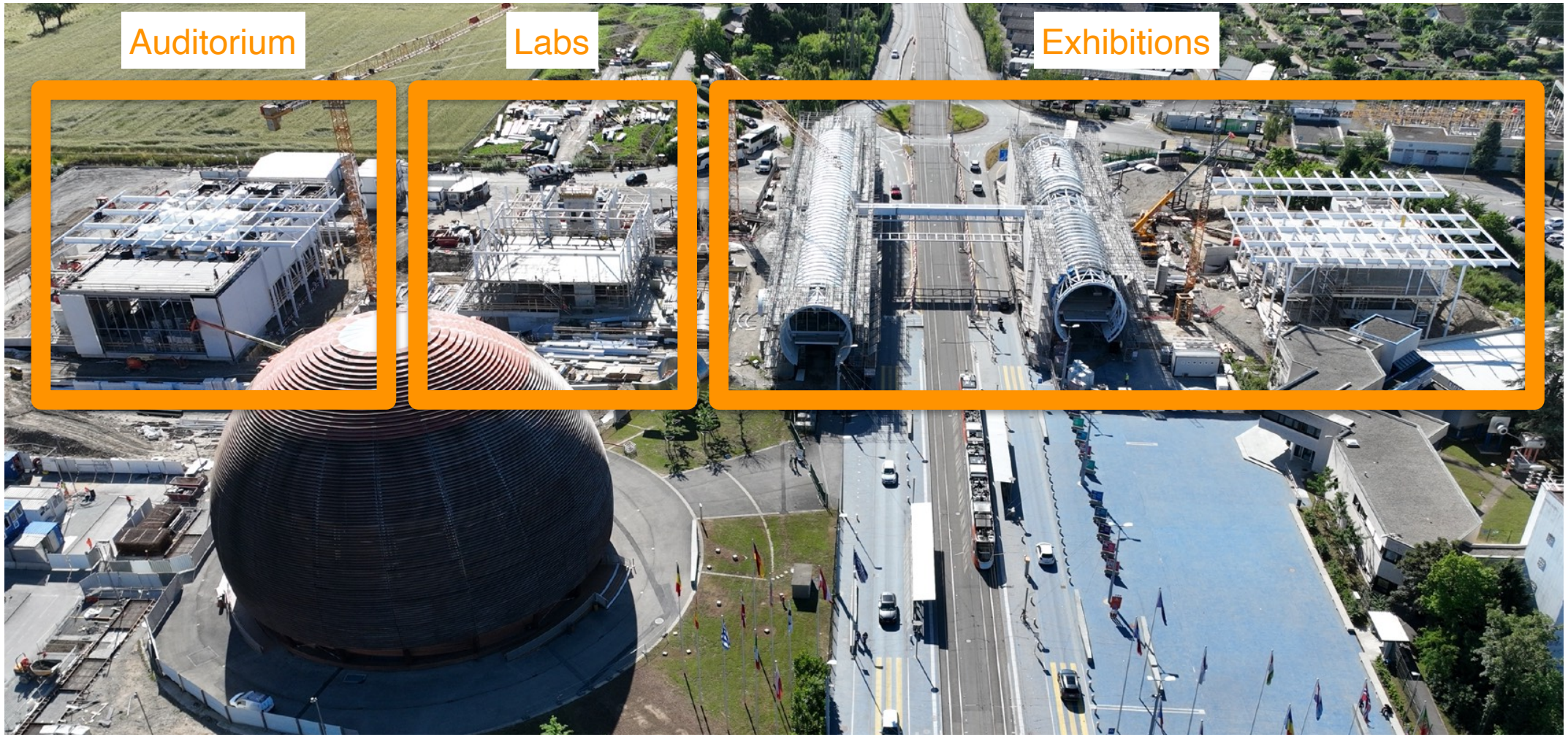

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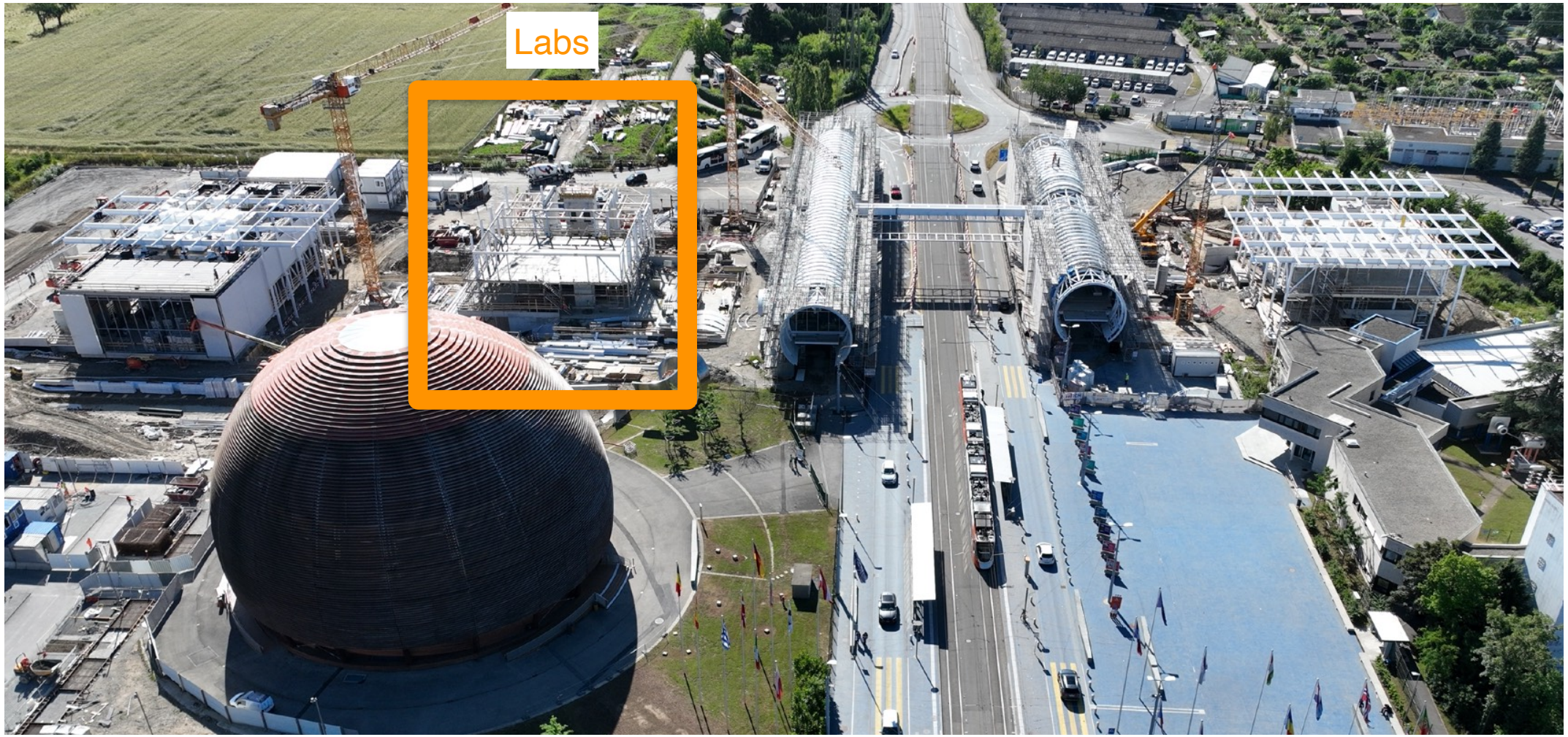
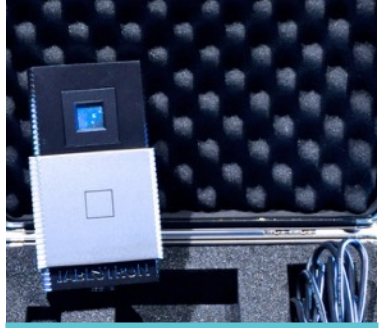


Educational labs

- 2 lab spaces for 24 participants each
- 45 - 90min hands-on workshops in different languages
- Tailored to age groups
- Focus on independent hands-on experimentation and teamwork

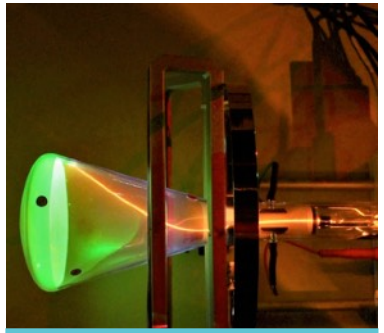
Education labs
content

- **Linked to the science, the discoveries, and the technologies at CERN**


Detection


Computing & Robotics

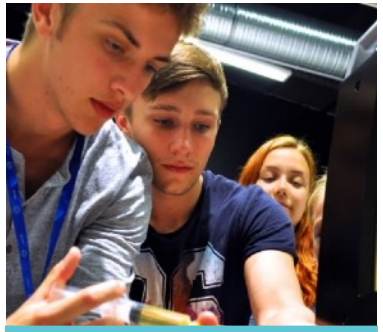

Engineering & Technology

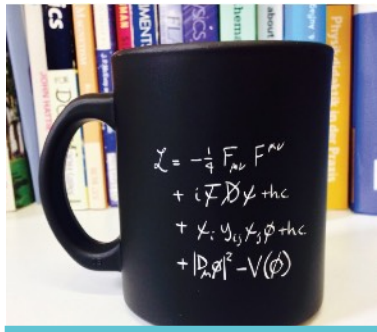

Acceleration


Vacuum & Cryogenics


Safety

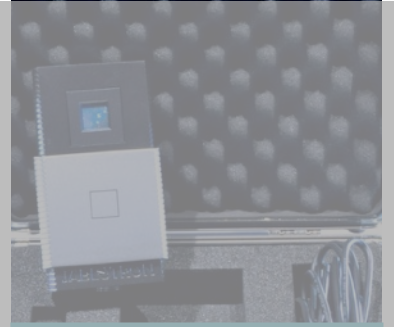

Magnets


Applications


Theory

Education labs
content

- **Linked to the science, the discoveries, and the technologies at CERN**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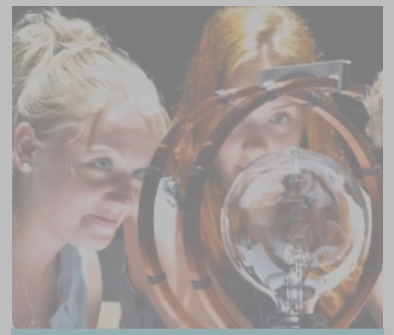
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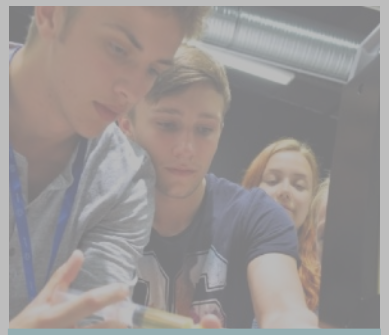
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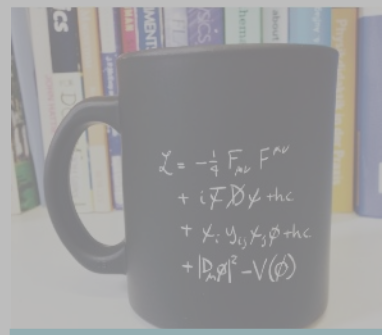
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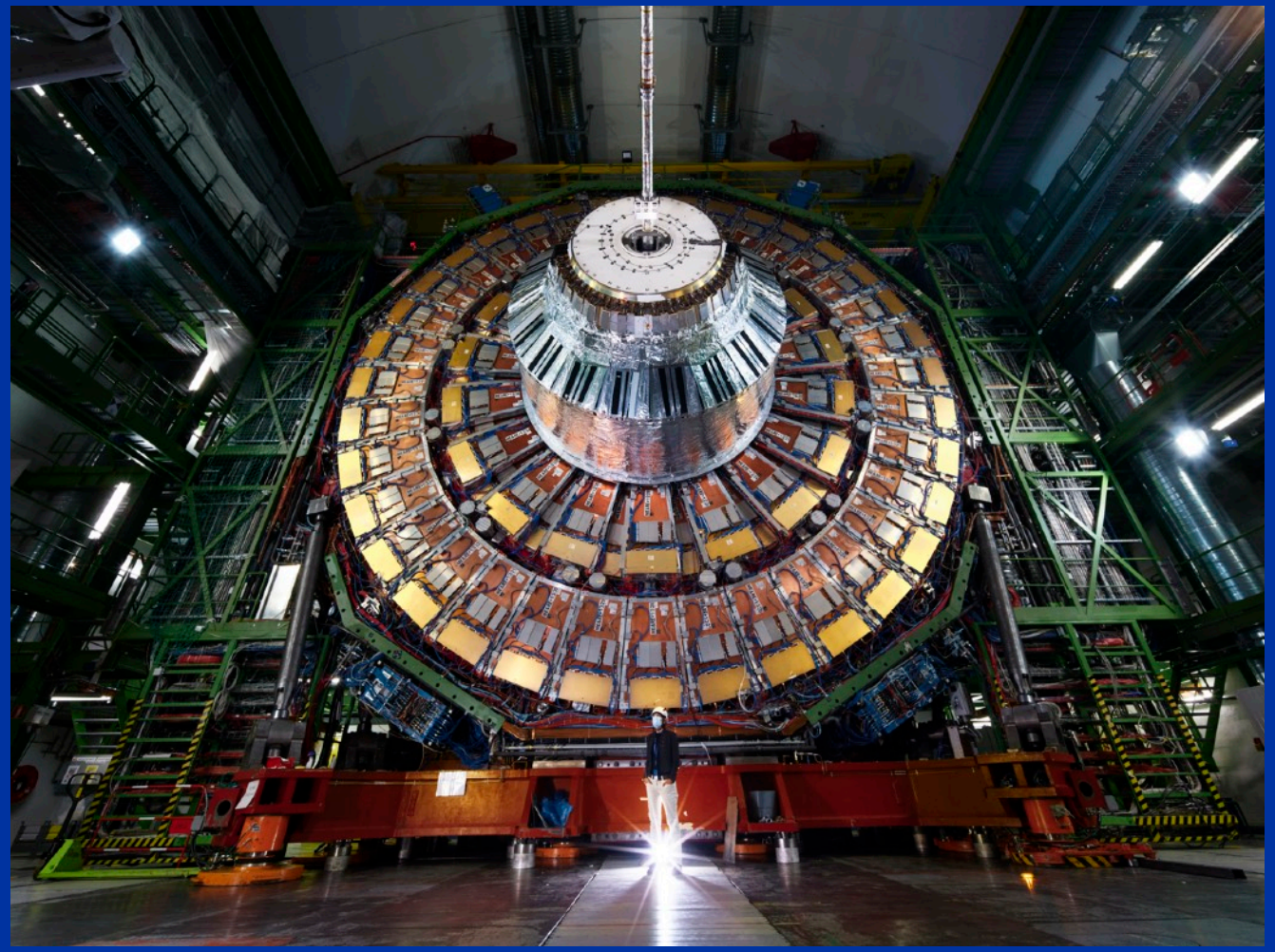
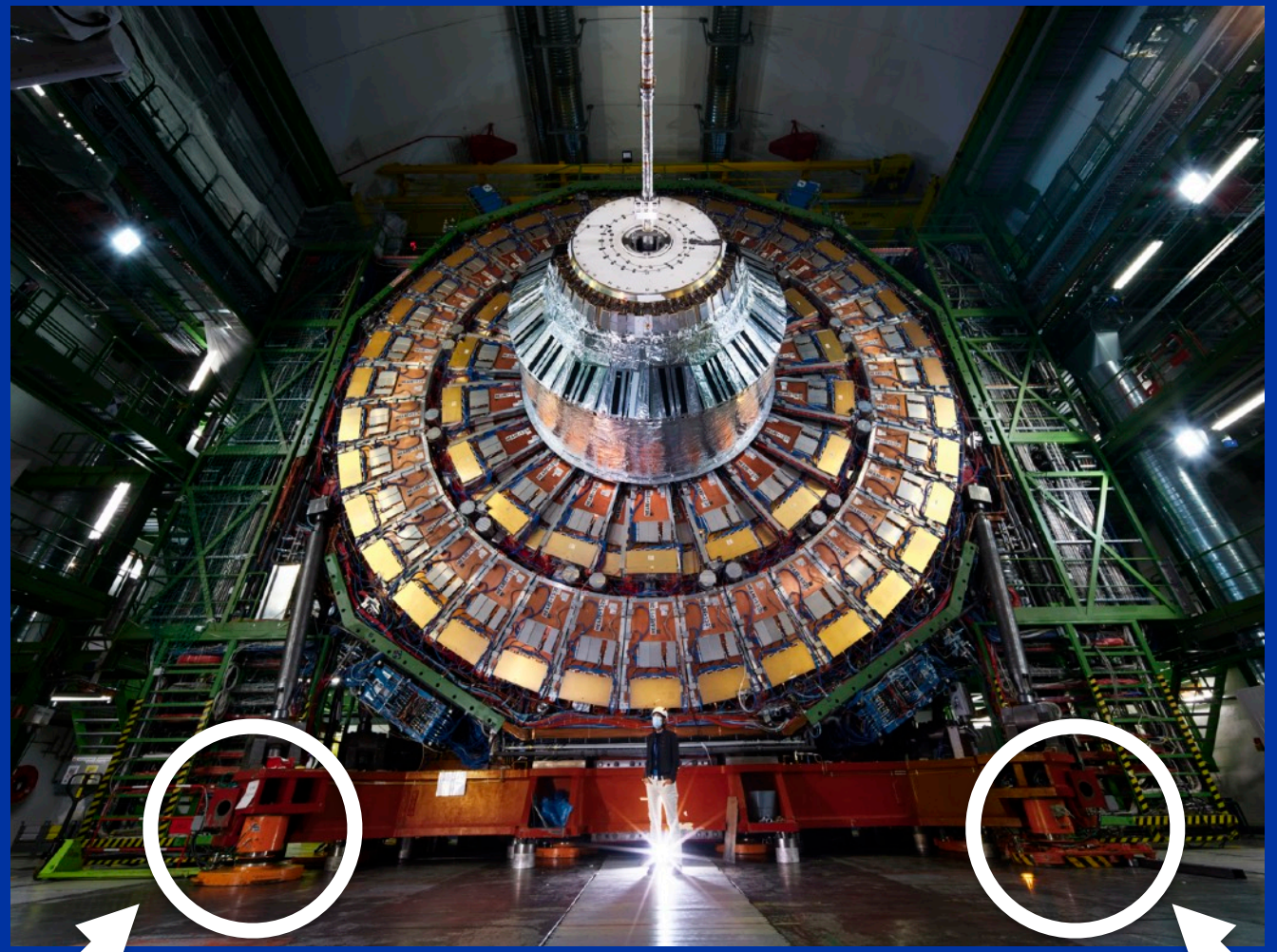


Question: How do you move a detector slice of 1000+ tonnes?



Answer: Air pads!

CMS air pads

- Each air pad can lift ~350 tonnes
- Compressed air at 25 - 35 bar
- Hydraulic strand jack system
- Speed: 0.5m/min

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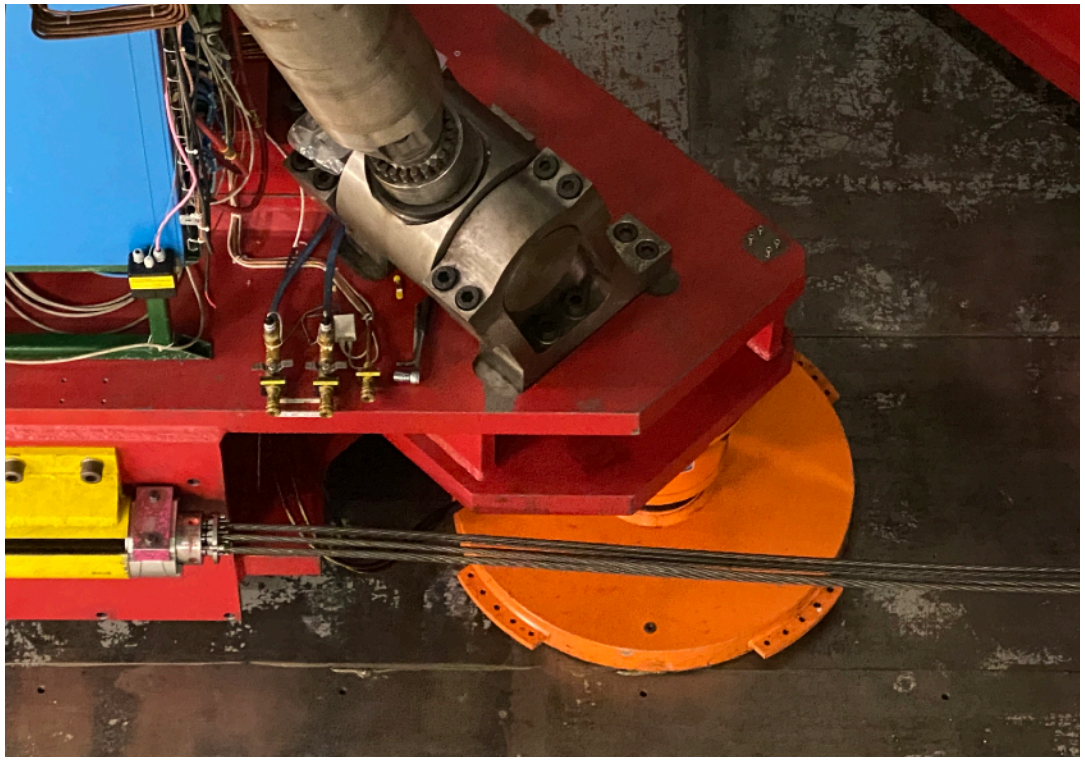
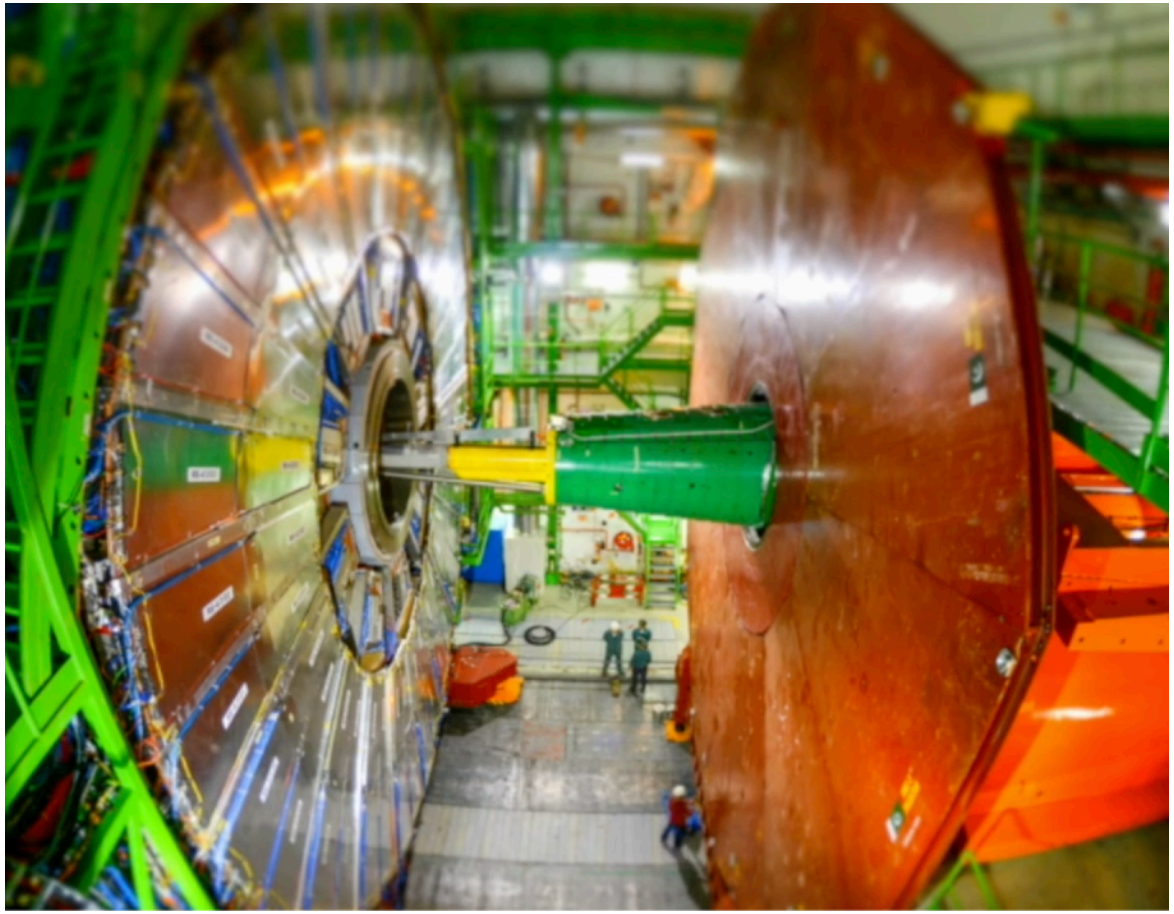


CMS air pads in action



Full video https://www.youtube.com/watch?v=p2CQgyp6cWw

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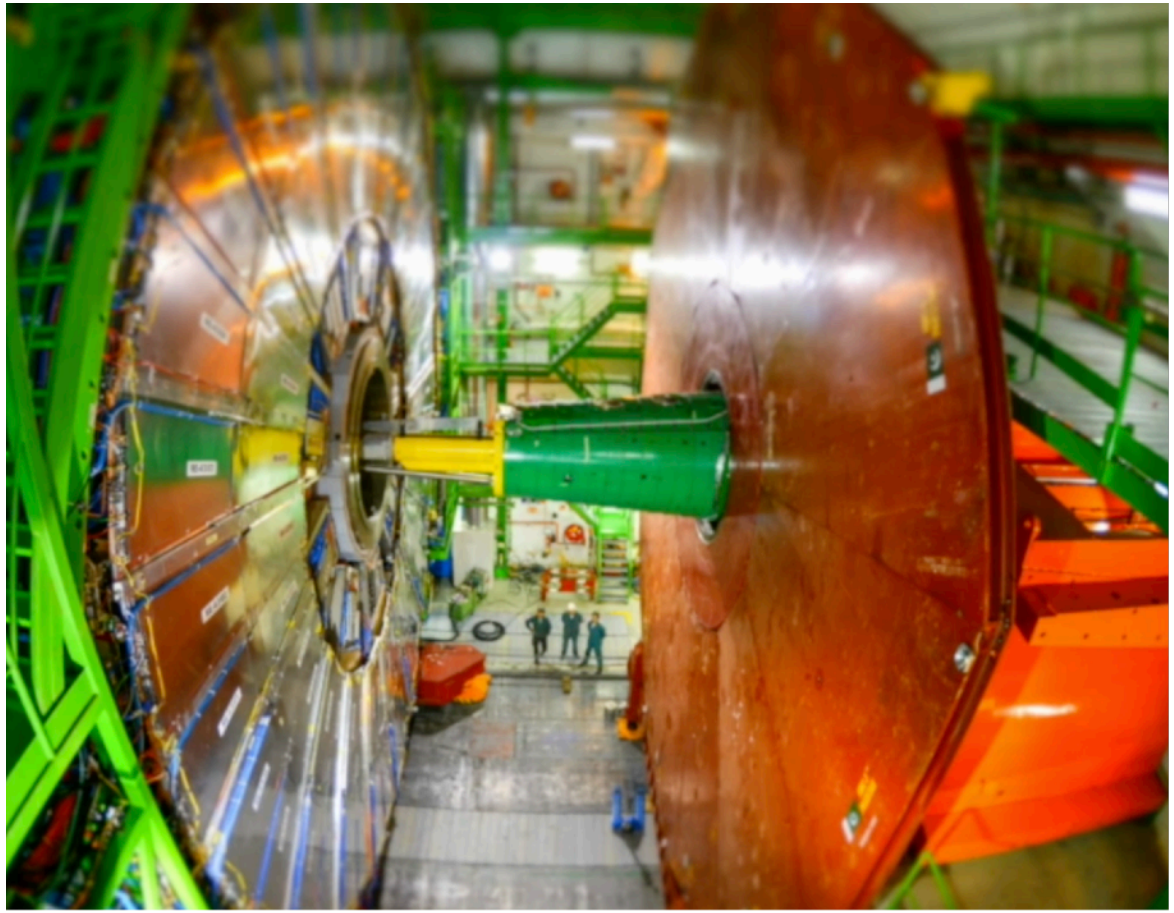
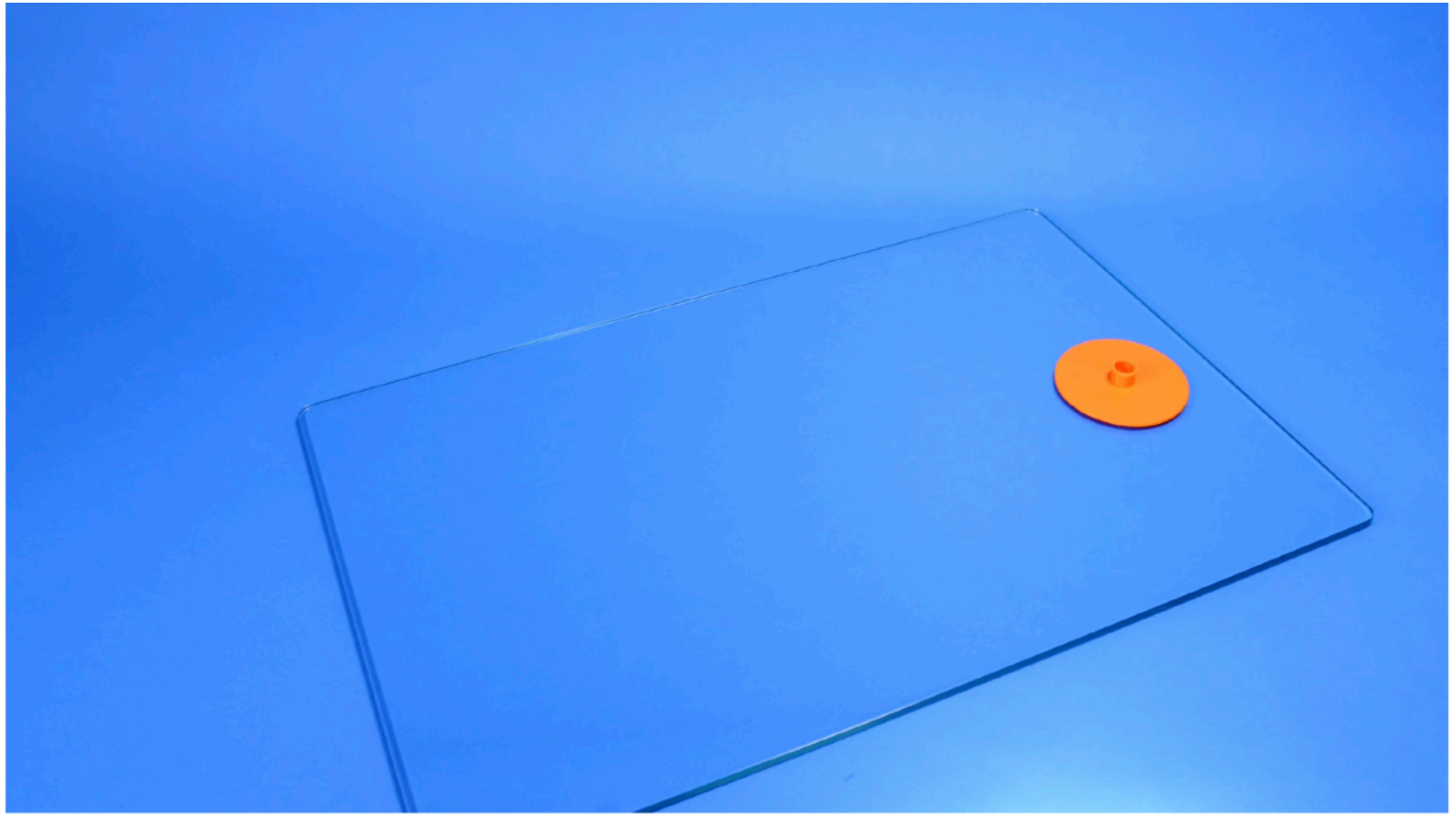


Full video https://www.youtube.com/watch?v=p2CQgyp6cWw

Inspiration

- **Build your own hovercraft!**

New educational activity about CMS air pads



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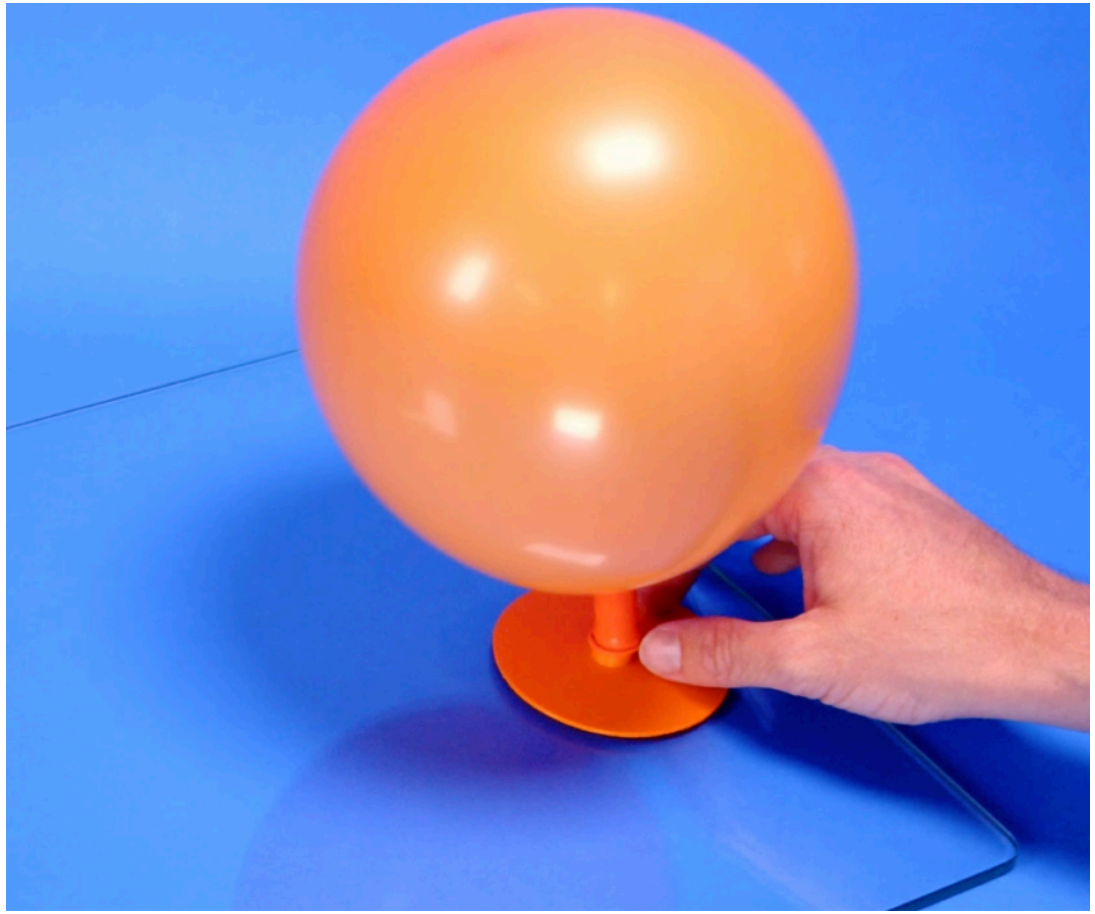

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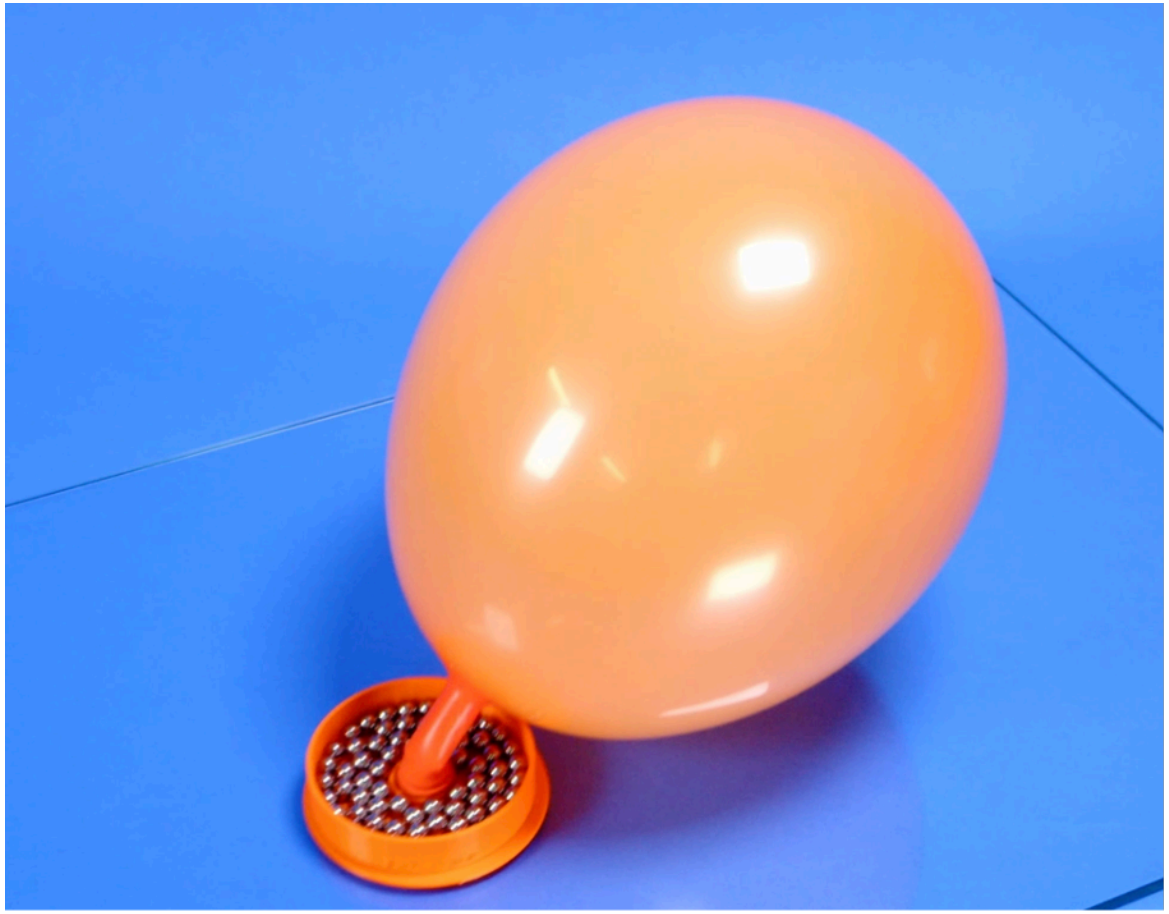

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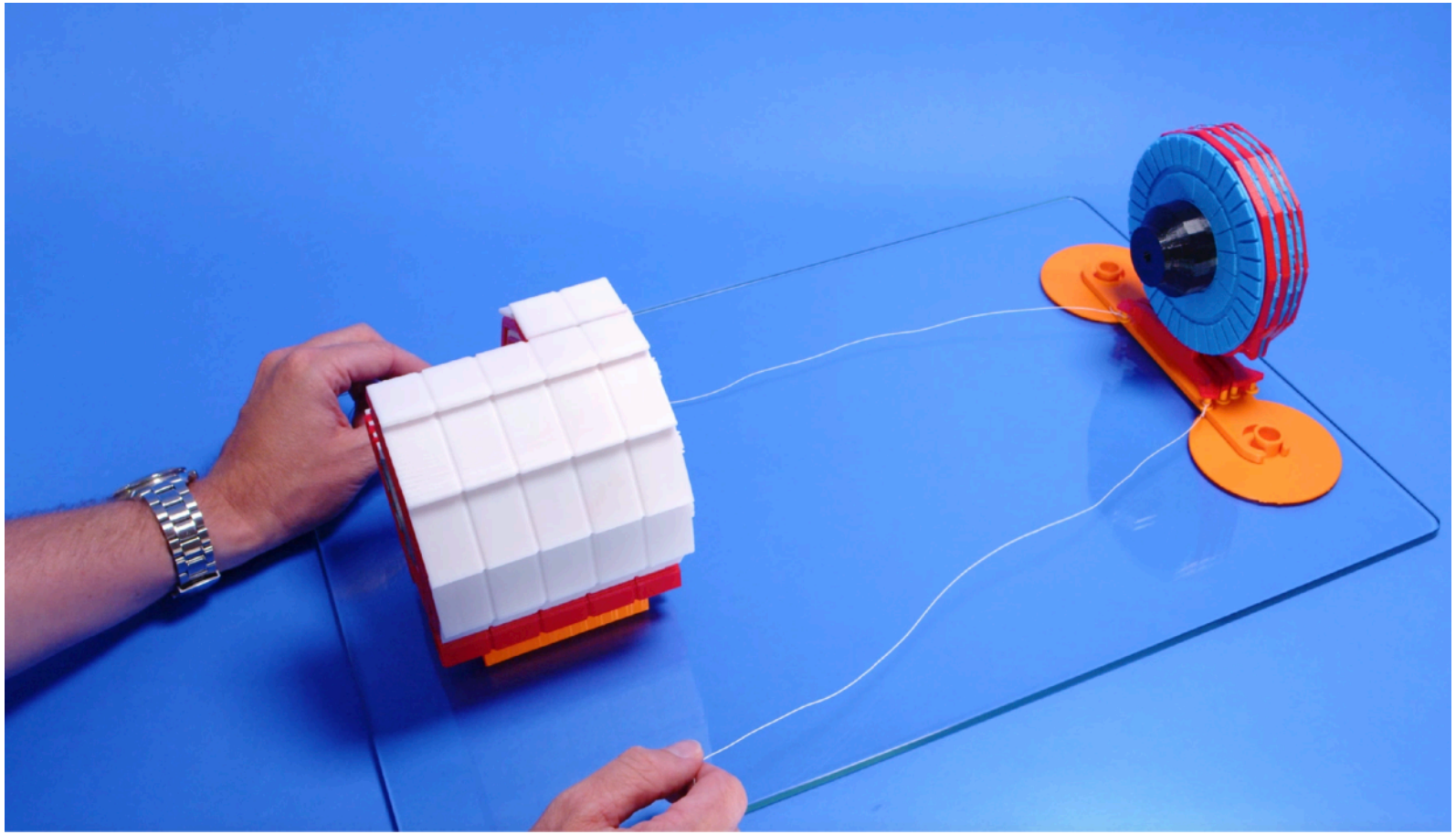

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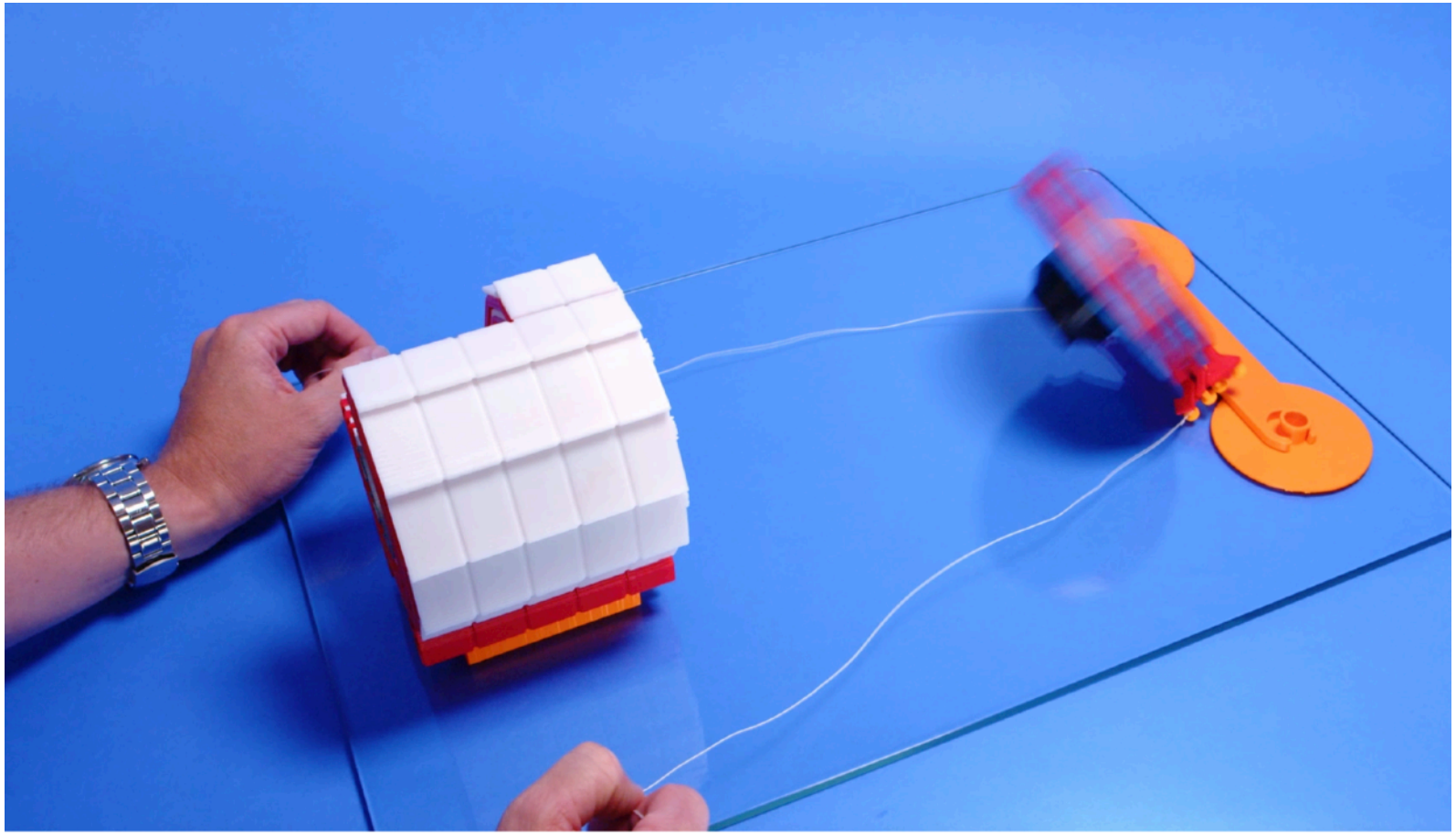

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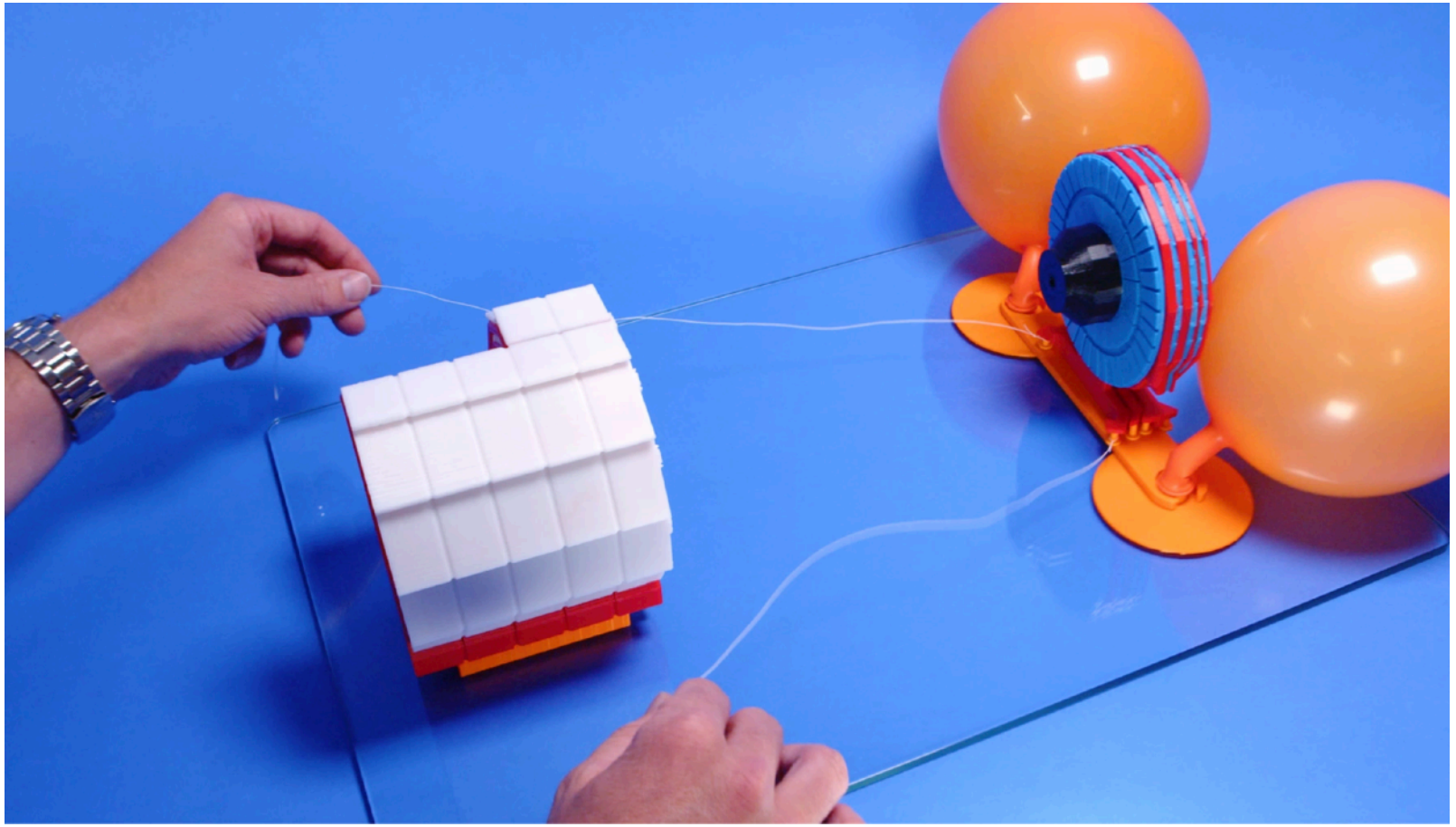

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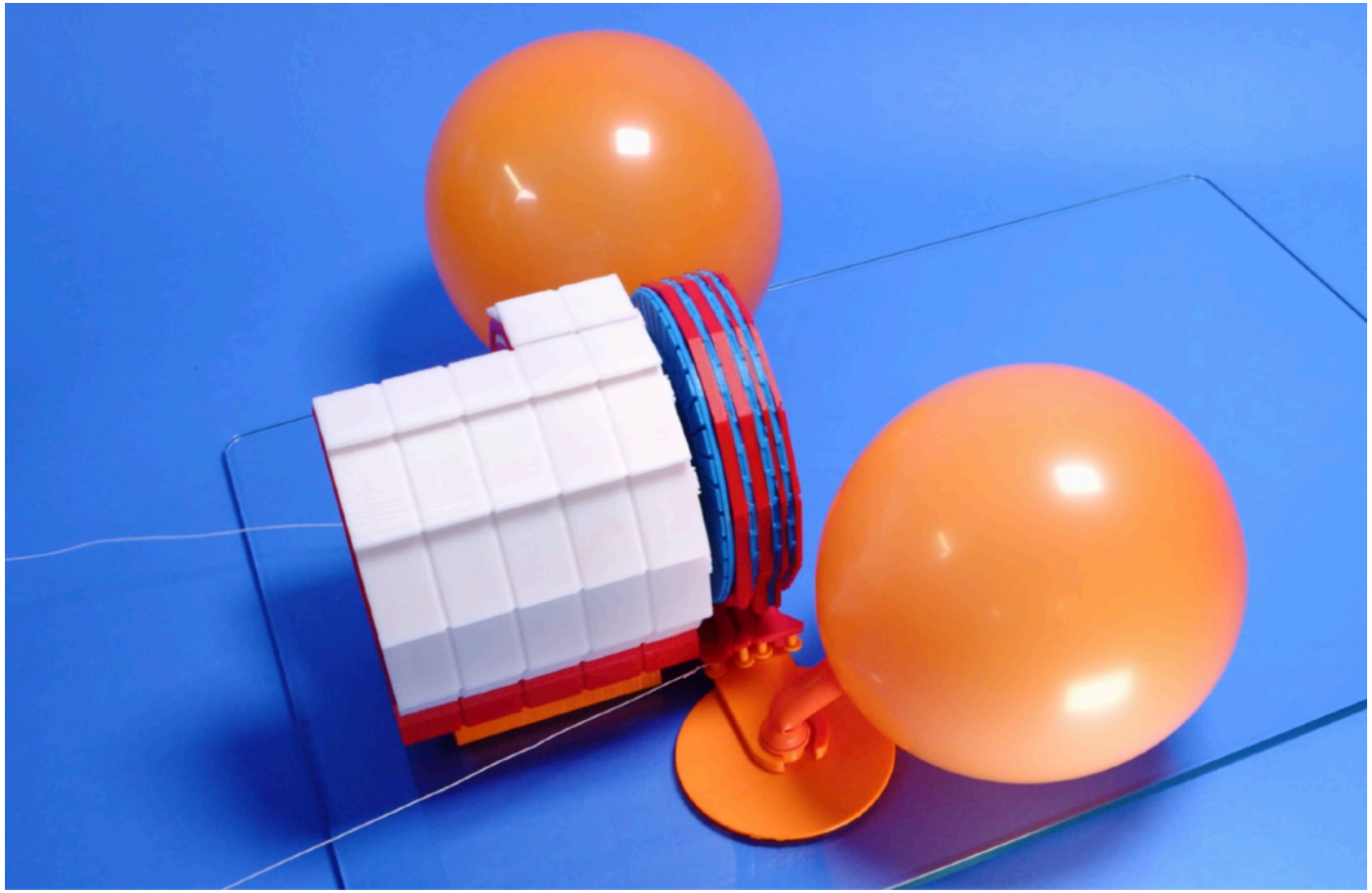
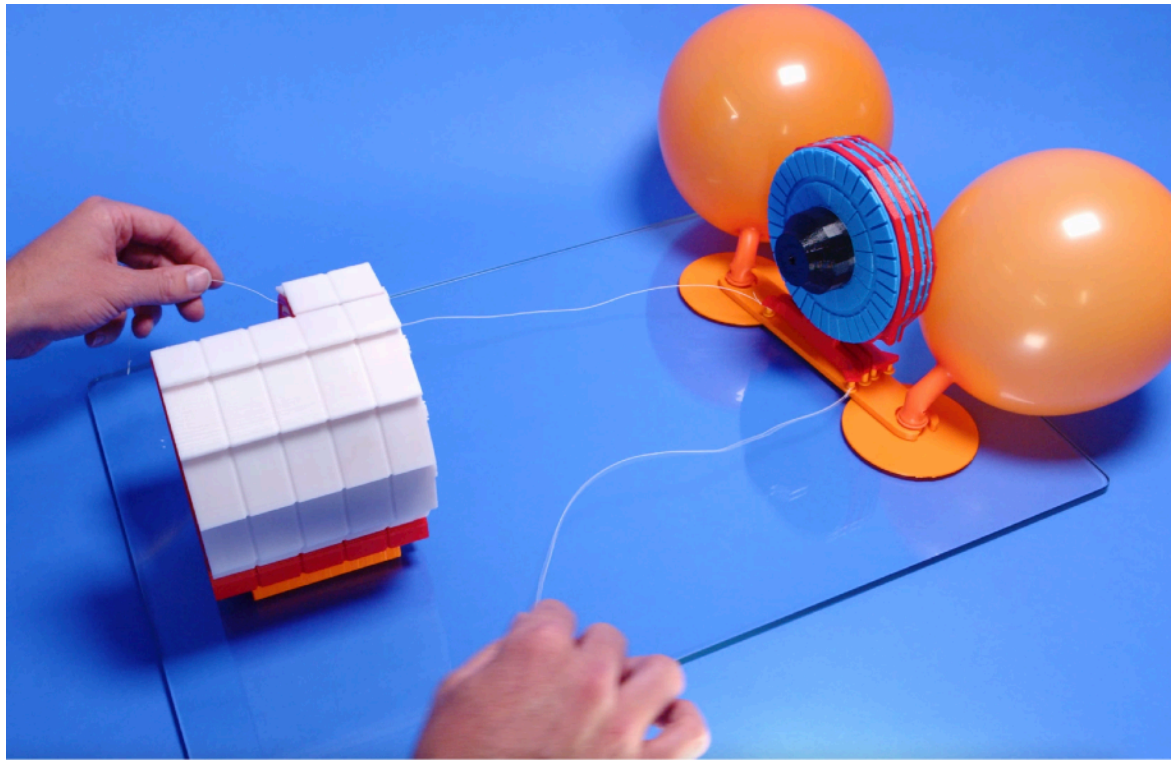


Engineering concepts tackled

- Design, Build, Test
- Tinkering
- Optimisation (e.g. which air flow rate, how much mass per pad, …)
- Operator control (e.g. alignment challenge, cooperation challenge, …)



Design principles

- **Authenticity:** topics that are linked to CERN, using authentic research equipment under guidance from volunteers from CERN's scientific community
- **Hands, head & heart:** hands-on manipulation, surprising observations, positive experiences with science and scientists
- **Empowerment:** enabling participants of all ages and backgrounds to engage in science, empowering them to do more than they thought they could do and showing that science is for everyone

Educational Goals

- Creating memorable positive impressions related to STEM (science, technology, engineering and math)
- Fostering positive attitudes towards STEM professionals and careers
- Raising awareness and understanding of nature of science & scientific methods

Making the educational labs a success

- Reach a wider audience (S'Cool LAB offer was 16+ physics enthusiasts)
- Integrated with science shows, exhibitions & online learning
- CERN / out-of-school halo
- Meet-a-scientist effect
- Positive effects of preparation and follow-up materials
- Links with outreach initiatives at CERN (e.g. Women In Technology, …)
- Work with local schools and partnerships (e.g. Animascience, …)

Motivational outcomes of the science outreach lab S'Cool LAB at CERN: A multilevel analysis
J. Woithe et al., Res Sci Teach. 2022;1–39.

Thank you!
If you have any cool / similar activities, please get in touch!

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