

Making an 'LHC in a box'

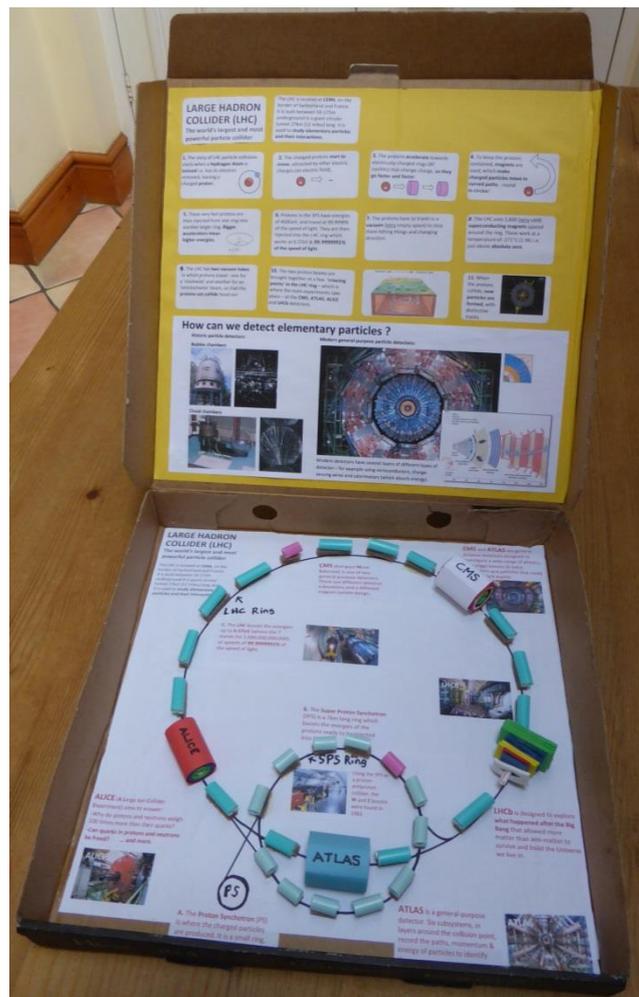
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making physics matter

This activity takes 1-2 hours (depending whether the detector kit is pre-cut). To make it you need (per box):

- 1 ~32cm pizza box.
- Set of 30 sticky labels (_Particle Accelerator Labels_24 per sheet) for inside lid and around your LHC ring
- 1 x pale blue thick (IKEA) straw (for magnets in SPS ring)
- 3 darker blue thick (IKEA) straw (for cryostats/magnets in LHC ring)
- 3cm of pink thick (IKEA) straw for RF cavities in both rings
- Six thinner drinking straws for twin beam pipes in LHC ring
- 1m x foam Draft Excluder (spongy tape that holds the straws above the pizza box and approximately in line with centre of detectors)
- Detector construction Sets (see below) – each with a short thin straw, craft foam pieces, part of a hexagonal Smarties tube (Atlas & CMS) and a paper surround.
- Scissors, glue such as copydex, tape, felt-tip pen and a pair of compasses for drawing rings
- PowerPoint 'Accelerators and detectors' – which you can walk through as you construct box.
- (Optionally) 'What are we made of_incl. elementary particles' print-out for outside of pizza box



Suggested detector 'kit':

CMS	ATLAS	ALICE	LHCb
2.5cm thin straw	2.5cm thin straw	2.5cm thin straw	Hole punch
1 x 1.5 x 2.5cm green foam	1 x 1.5 x 2.5cm red foam	1 x 1.5 x 2.5cm yellow foam	4 cm thin straw
1 x 3 x 2.5cm yellow foam	1 x 3 x 2.5cm blue foam	1 x 3 x 2.5cm green foam	Foam rectangles pre-punched with holes for straw ~0.5cm from one long edge:
1 x 4.5 x 2.5cm blue foam	1 x 4.5 x 2.5cm yellow foam	1 x 4.5 x 2.5cm blue foam	4 x 1.5 x 3.5cm green foam
1 x 5.5 x 2.5cm white foam	1 x 5.5 x 2.5cm blue foam	1 x 5.5 x 2.5cm red foam	4 x 1.2 x 3cm blue foam
1 x 7 x 2.5cm red foam	1 x 7 x 2.5cm yellow foam	1 x 7 x 2.5cm red paper	2 x 1.2 x 3cm yellow foam
1 x 8 x 2.5cm red foam	1 x 8 x 2.5cm blue foam		1 x 1 x 2cm red foam
2.5cm of Smartie tube	2.5cm of Smartie tube		1 x 1 x 3.5cm blue foam folded over with two holes
1 x 9 x 2.5cm white paper	1 x 9 x 2.5cm blue paper		1 x 1 x 2cm white foam with eye-shaped hole

Instructions:

- 1 Using the PowerPoint to talk through the basics of particle acceleration and magnetic deflection, stick labels 1-6 on inside lid of box.
2. Draw intersecting LHC (12cm radius) and SPS rings (5cm radius), small PS ring and joining lines on base of pizza box (or stick in an A3 print-out of this). See photo on the following page.
3. Stick the next 8 sticky labels in place on inside lid of box.

4. Fix draught excluder to short pink straw and pale blue straw. Cut these into 1-1.5 cm lengths and place them on SPS ring with the pink RF cavity at '1-o'clock' on the SPS ring (and 11 o'clock on the LHC ring). Glue these in place, leaving a gap where the LHC ring crosses the SPS.

5. Stick labels 15 & 16 in the box and fit two thin straws inside the thick darker blue straws to represent the twin beam pipes in the LHC ring. Fix the draught excluder to the thick straws, cut into 1.5-2cm lengths and put in place – leaving gaps for the detectors (at 12 o'clock (CMS), 4 o'clock (LHCb), 6 o'clock (ATLAS) and 8 o'clock (ALICE)).

6. Stick the remaining labels in the box and make the detectors. For CMS, ATLAS and ALICE wrap foam layers in order of length around the straw, taping each in place. Finish by putting CMS an ATLAS into the hexagonal Smartie tube, wrapping with the paper and labelling.

7. To make LHCb, thread the straw through the holes in the foam layers in order.

8. Glue the LHC Cryostats/magnets, RF cavity and detectors in place.

9. Decorate the outside of the Pizza box as you want (with 'big questions' such as 'What are we made of?', 'How did our Universe begin?', 'What will happen to our Universe?' round the sides and how CERN tries to answer them).

