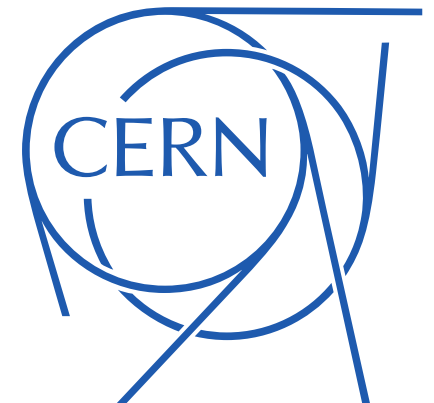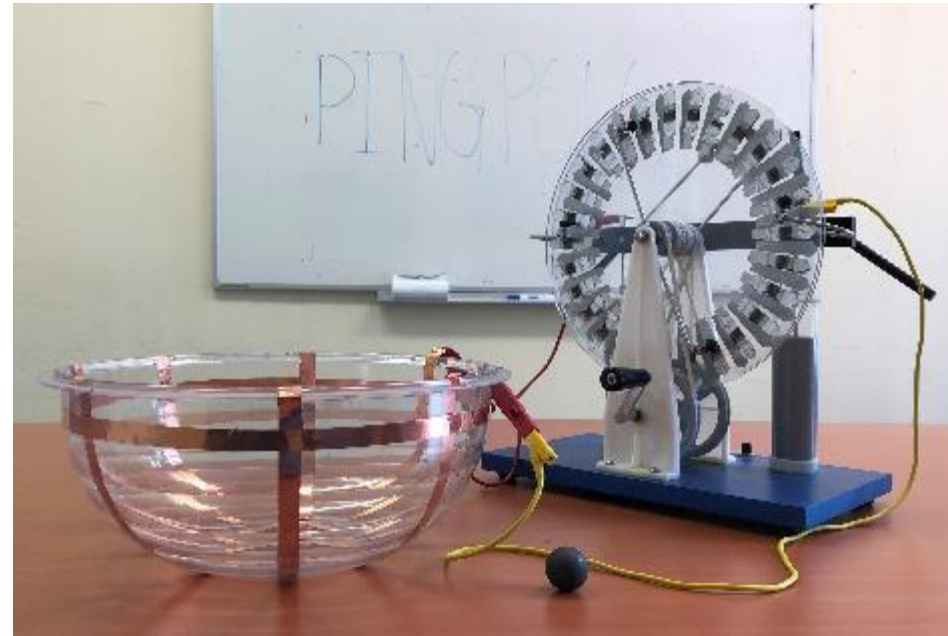# PePPA

Peta Electron Volt Ping Pong Accelerator
for the CERN Open Days

7/3/2019

# Ingredients

- Electrostatic acceleration
  - High voltage source (Wimshurst Machine, Van-de-Graaff Generator, etc..)
  - conductive tape
- Salad Bowl
- 'particles' (electrically conductive)

# Working principle

- DC High voltage!

- Particle charge must change in order to accelerate
  - conductive 'Particle'
  - by crossing electrodes, charge is changed
  - ➤ repellent force
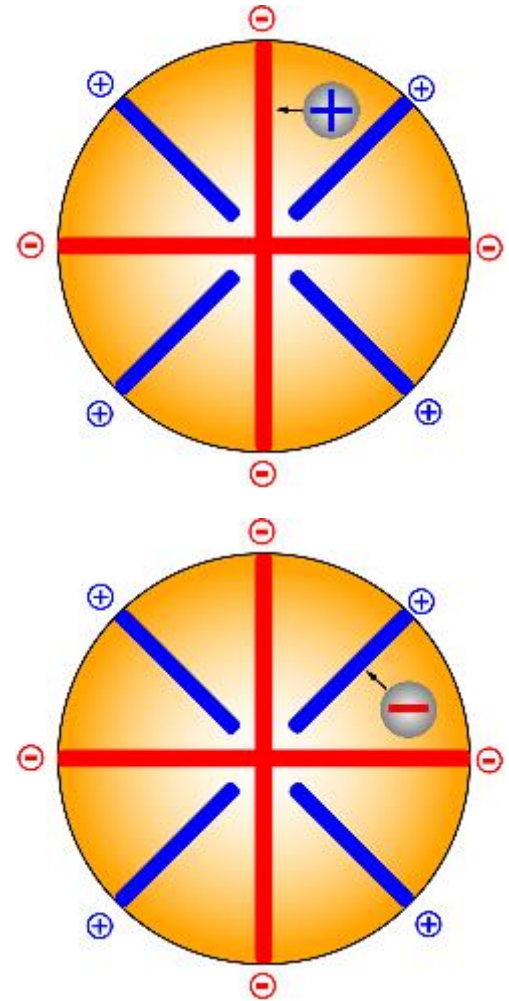
# At a glance

| | Ping Pong Accelerator | Large Hadron Collider (LHC) |
|---|---|---|
| Accelerated Particle | Ping pong ball | Protons (sometimes ions) |
| Number of accelerated particles | One | More than 100 000 000 000 000 protons for each of the two counter-rotating beams |
| Charge per particle | Alternating | Constant |
| Accelerating voltage | Constant | Alternating |
| How to keep the particles on their circular track? | Wall of the salad bowl | **1232 superconducting dipole magnets with a stored energy of 9 gigajoule, equivalent to the kinetic energy of a 16-storey cruise ship at 50 km/h** |
| Particle velocity in metre/second | Less than 2 metres/second | More than 299 000 000 metres/second |
| Particle velocity in percent of the speed of light | Less than 0.00000001% | **More than 99.9999%** |
| Circumference | More than 27 cm | Nearly 27 km |
| Particle revolutions per second | Less than 1 per second | 11 245 per second |
| Stored energy per particle | About 8 PeV | About 6.5 TeV |
| Stored energy for all particles | Less than 2 millijoule | **360 megajoule for each beam, equivalent to the kinetic energy of a 200-m-long train at 155 km/h** |
| **Required Machine Protection** | **None** | **Very fast and ultra-reliable Machine Protection and Beam Interlock System** |

# Time to test it.