Experimental observation of isolated large transverse energy electrons with associated missing energy at $\sqrt{s} = 540\,\text{GeV}$

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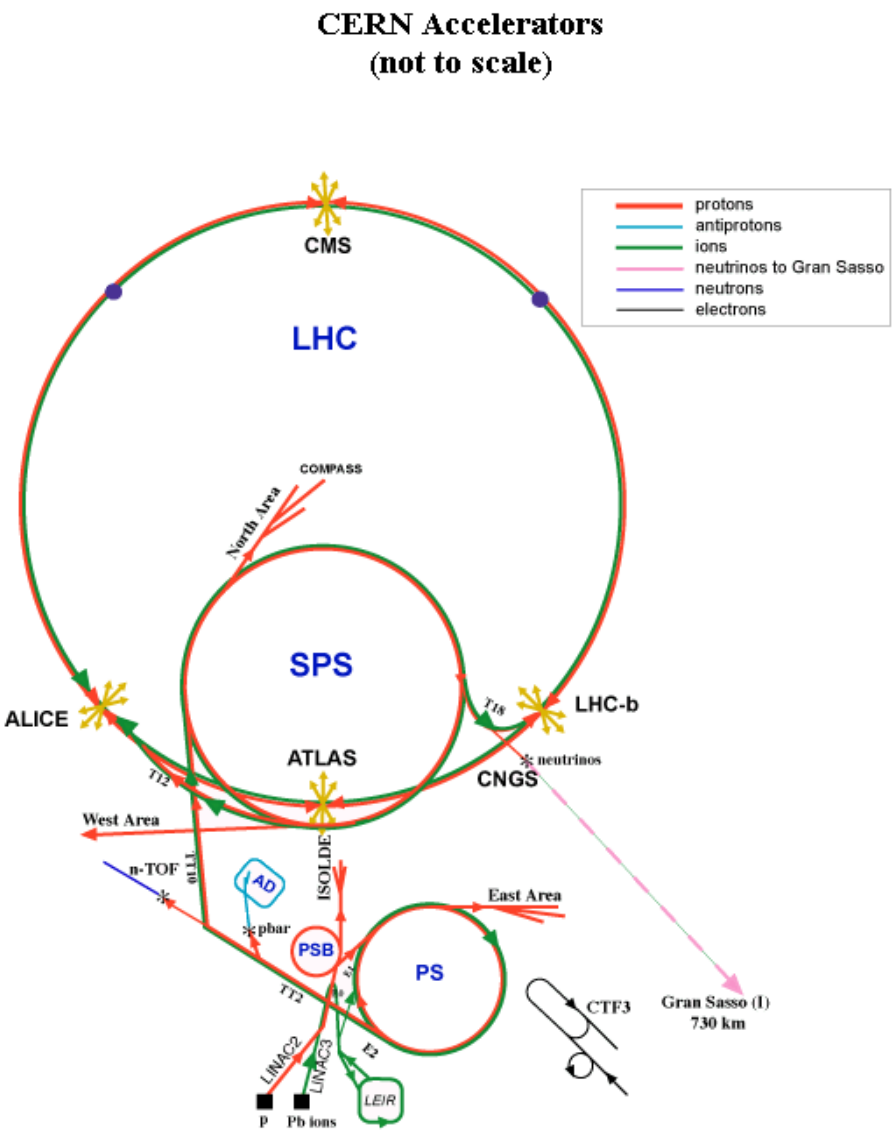
Overview of the paper

Super Proton Synchrotron (SPS) @ CERN



- 1957 - Synchrocyclotron starts up
- 1959 - Proton Synchrotron starts up
- 1976 - Super Proton Synchrotron starts up
- 1989 - LEP first injection
- 1999 - Antiproton Decelerator approved
- 2000 - LEP final shutdown
- 2008 - LHC starts up

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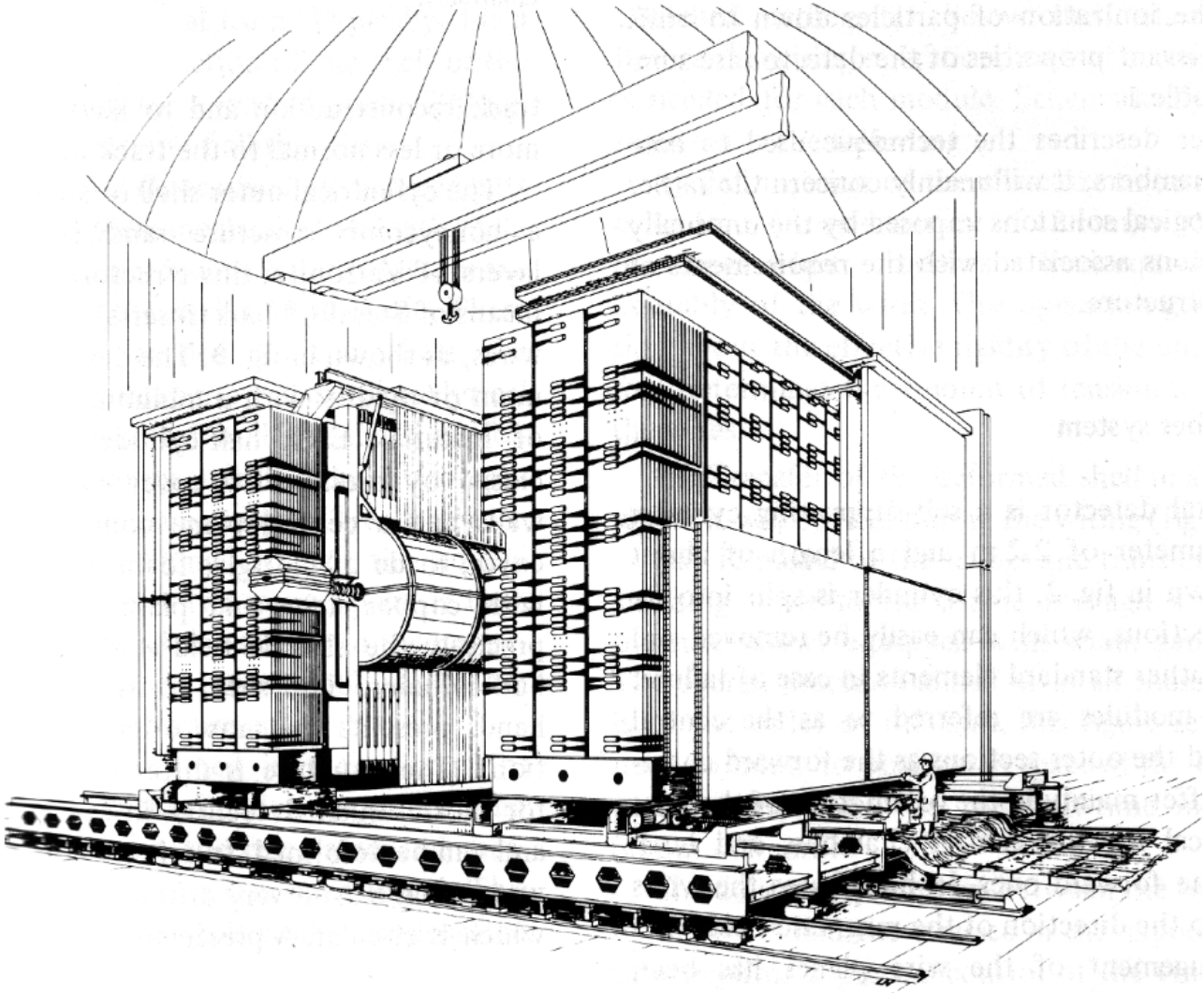
Underground Area 1 (UA1) - detector



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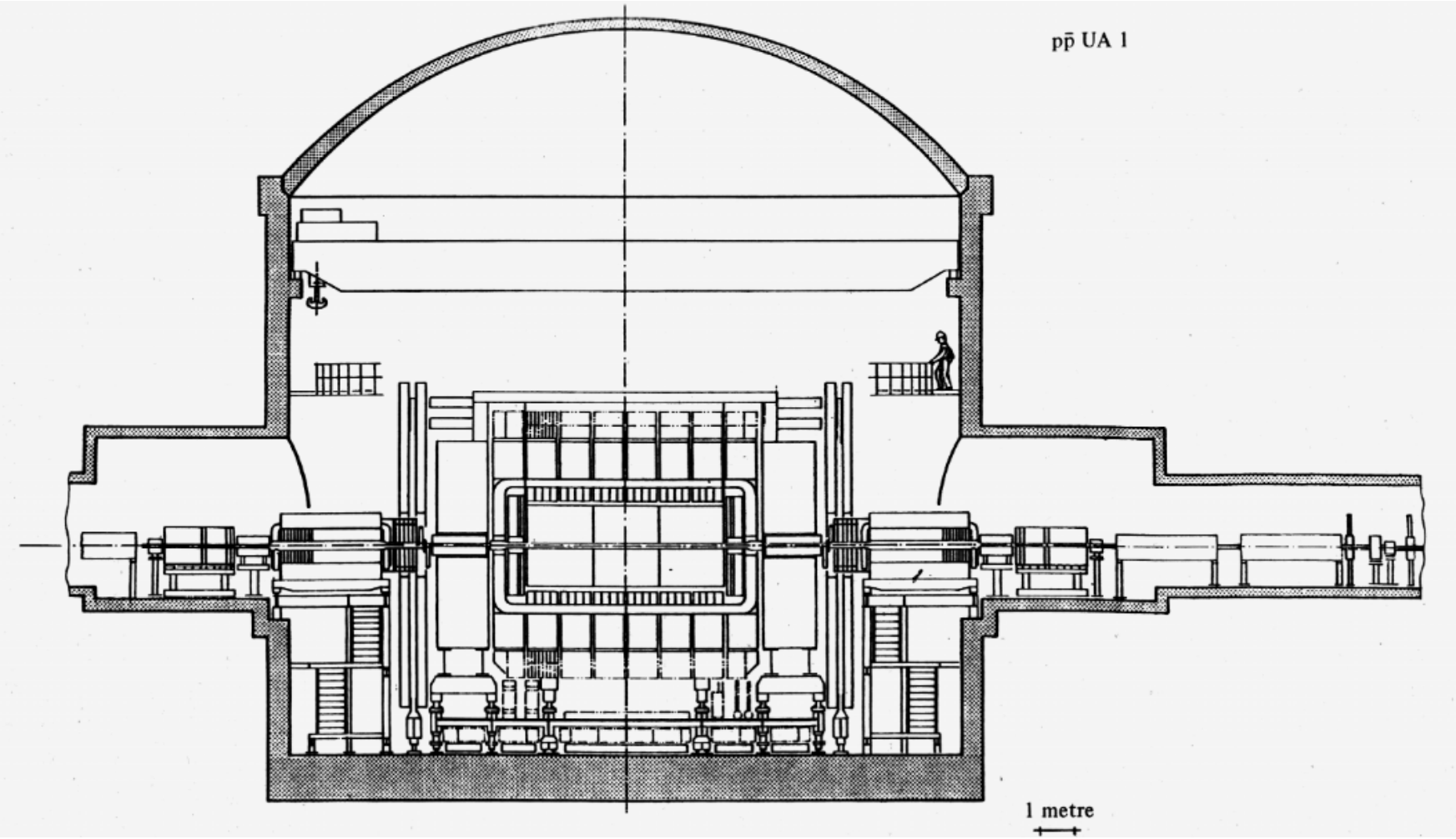
Underground Area 1 (UA1) - detector



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Underground Area 1 (UA1) - detector

- ran from 1981 until 1990
- moveable detector (also UA2) custom built around SPS for $p\bar{p}$ collisions
- could be rolled back to allow fixed-target operation of SPS

- transverse dipole magnet produced uniform field of 0.7T over $7 \times 3.5 \times 3.5\text{m}^3$
- central detector = six-chambered cylinder, 5.8 m length, 2.3 m diameter
- produced bubble-chamber quality pictures of each interaction

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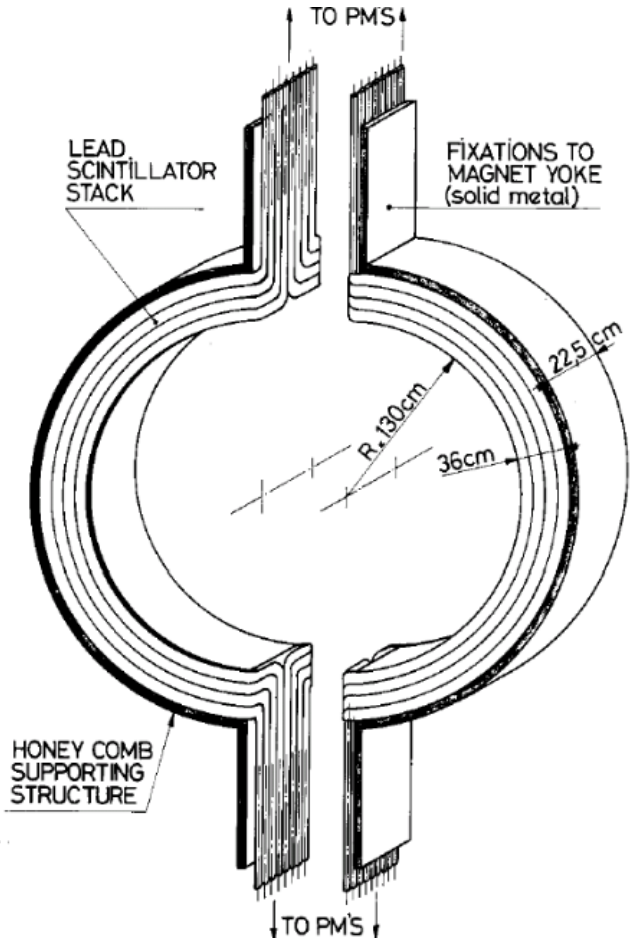
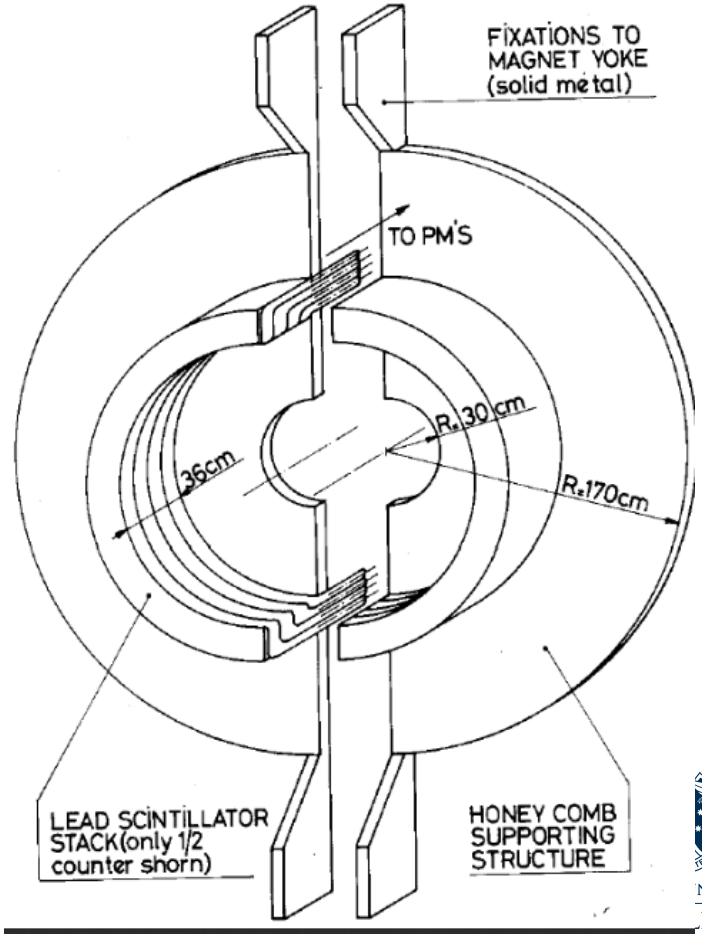
Underground Area 1 (UA1) - detector

- 48 barrel EM calorimeters, called 'gondolas'
- 64 end-cap EM calorimeters, called 'bouchons'





Underground Area 1 (UA1) - experiment

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Particle physics up to 1983

- 1897 - electron discovered
- 1932 - positron discovered
- 1937 - muon discovered
- 1956 - (electron) neutrino discovered
- 1962 - muon neutrino discovered
- 1968 - Glashow, Weinberg and Salam formulate unified electroweak theory
- 1969 - partons observed
- 1975 - tau discovered
- 1983 - ???

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- 1983 - W and Z bosons discovered

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Predictions of W mass + cross-section

Data taking

- proton and anti-protons collided at $\sqrt{s} = 540\,\text{GeV}$
- $18\,\text{nb}^{-1}$ data set ($\sim 10^9$ collisions), collected at UA1
- recorded over 30 days during November and December 1982
- triggers were used to select interesting events

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Triggers

- four trigger conditions were required:
  (1) at least 10 GeV is transverse energy in 2 gondolas or 2 bouchons
  (2)

Selection criteria and cuts

- proton and anti-protons collided at $\sqrt{s} = 540\,\text{GeV}$
- $14\,\text{nb}^{-1}$ data set, collected at UA1

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