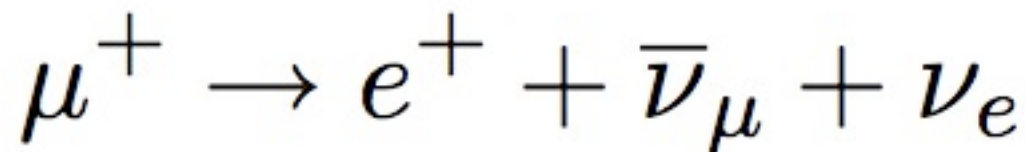
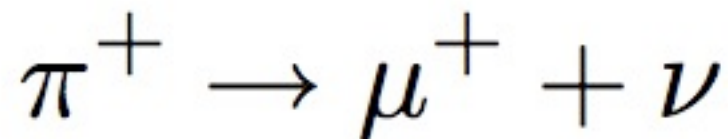
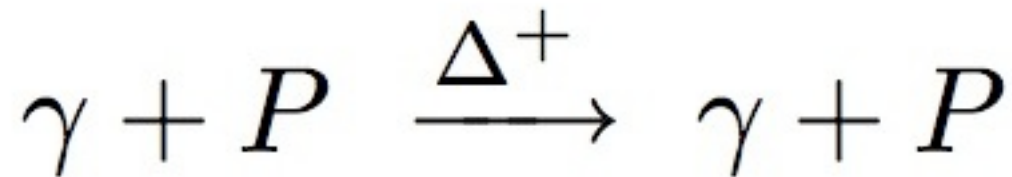
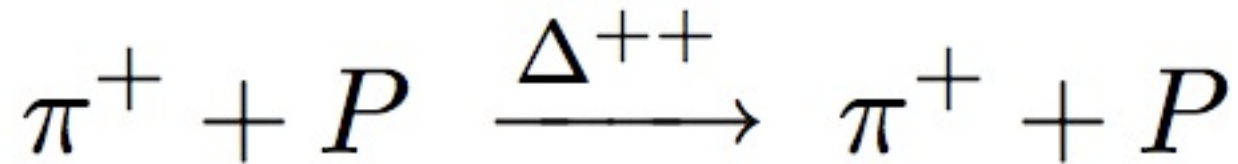


Experiments of the last 60 years

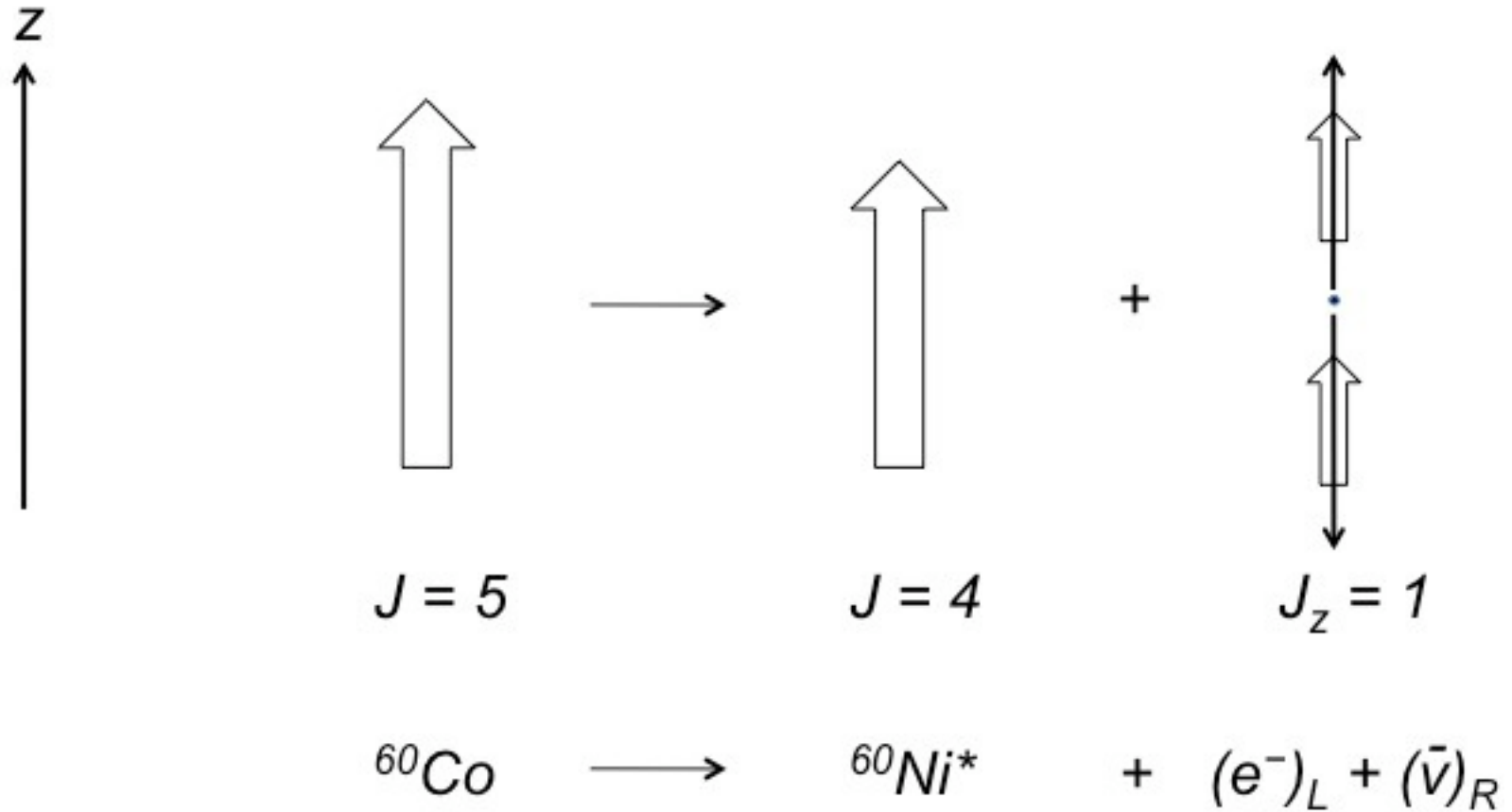
Matthew Wing (UCL)

- The early years
- Neutrino experiments
- High-energy colliding-beam experiments (and some fixed-target results)

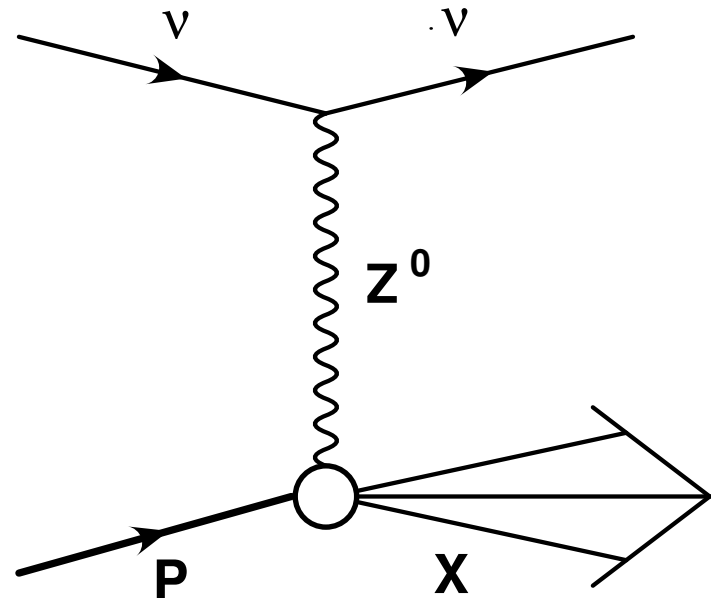
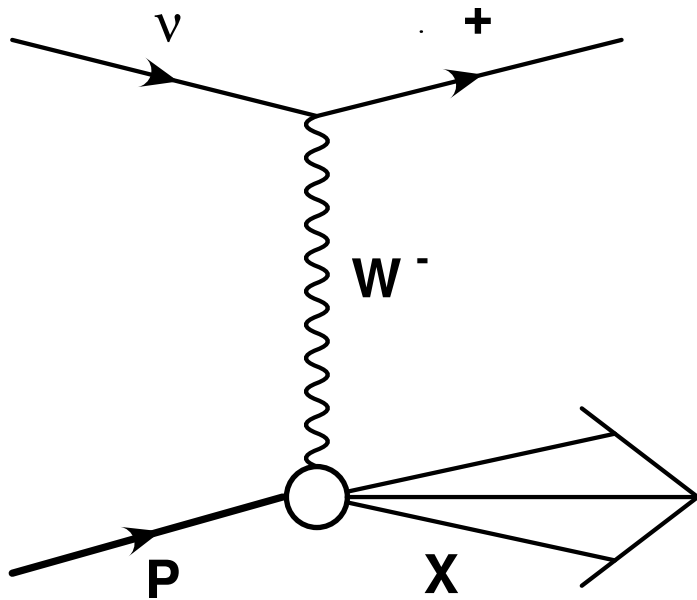
Early years



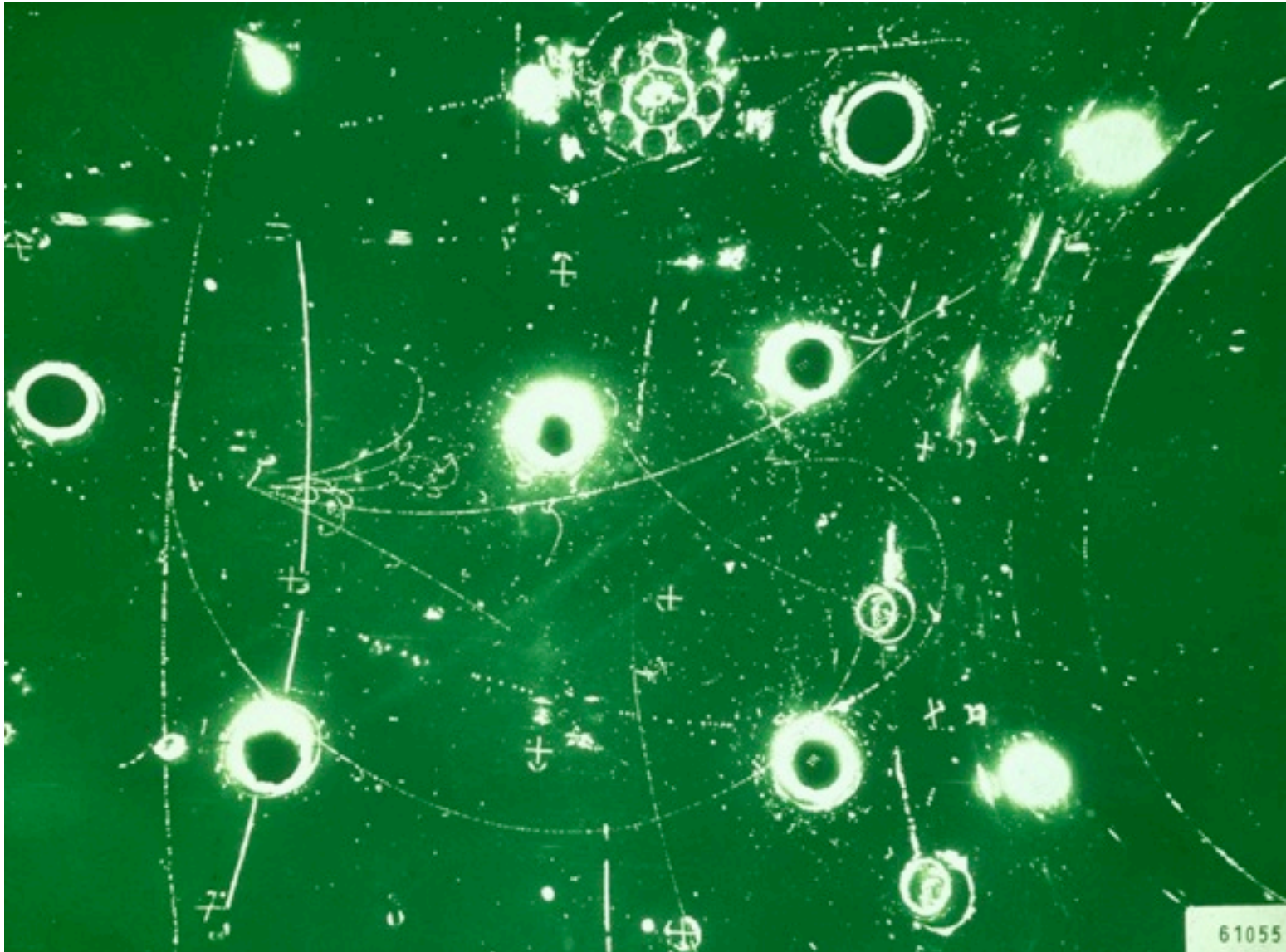
Parity violation



Discovery of neutral currents

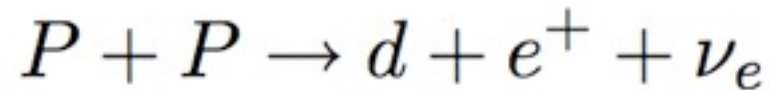


A Gargamelle event

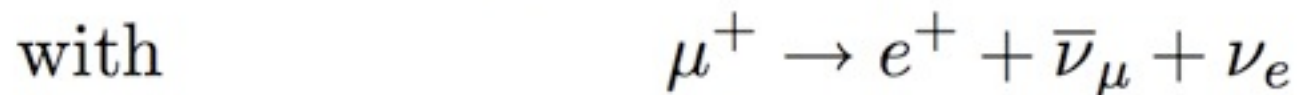
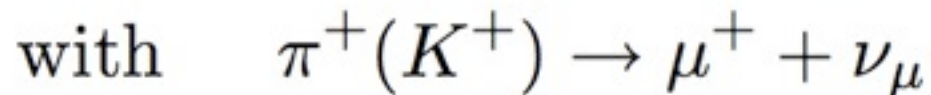
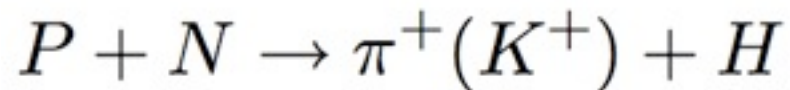


The neutrino problem

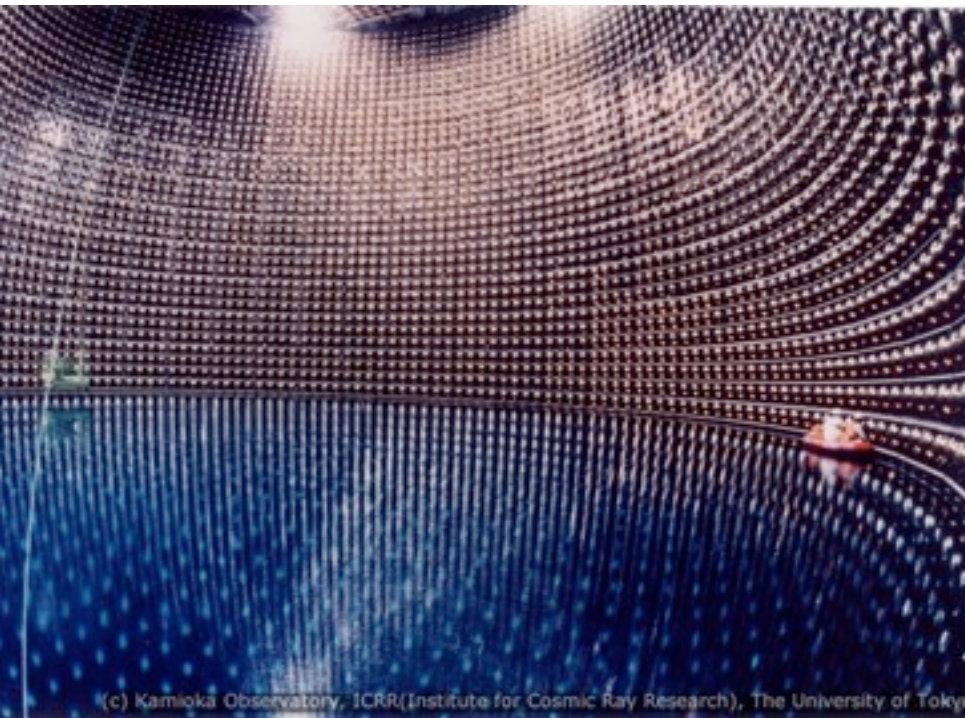
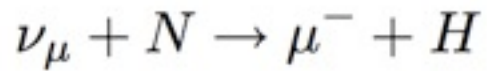
Solar neutrinos :



Atmospheric neutrinos :



SuperKamiokande



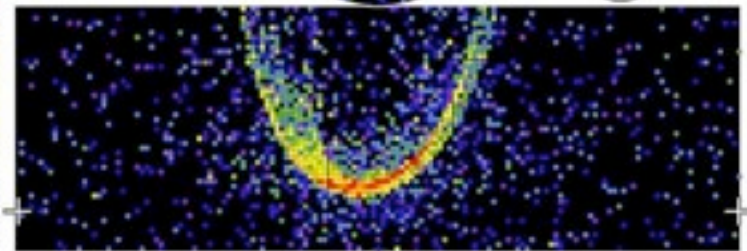
(c) Kamioka Observatory, ICRR(Institute for Cosmic Ray Research), The University of Tokyo

Super-Kamiokande I

Run: 1728 Sub: 4 Ev: 25171
 96-06-29-09:02:03
 Doser: 2294 kVh, 1095 μ C
 Doser: 4 kVh, 52 μ C (in-time)
 Trigger ID: 0x0
 S well: 592.9 cm
 PC no-106a, p = 1002.9 96/07

Charge (pe)

- >24.7
- 21.3-24.7
- 18.0-21.3
- 14.7-18.0
- 11.3-14.7
- 8.0-11.3
- 4.7-8.0
- 1.3-4.7
- 0.0-1.3
- -3.3-1.3
- -6.7-1.3
- -10.0-1.3



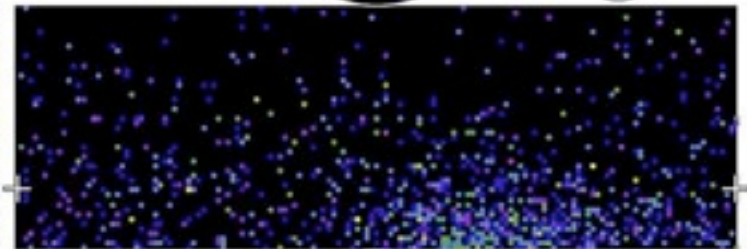
(c) Super-Kamiokande Collaboration

Super-Kamiokande I

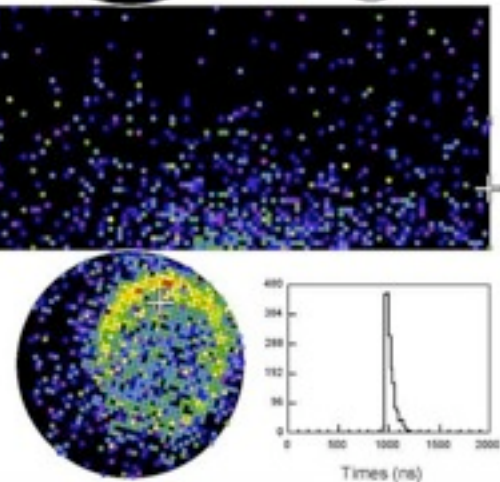
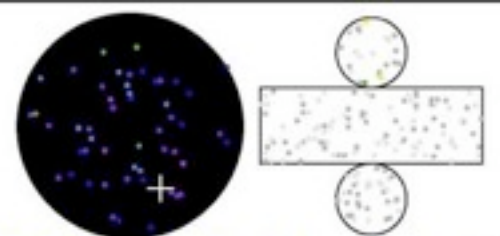
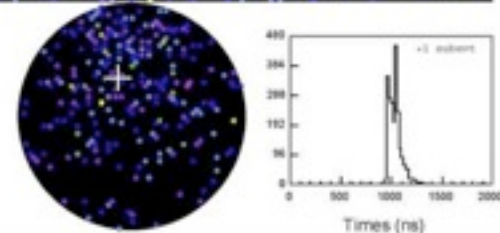
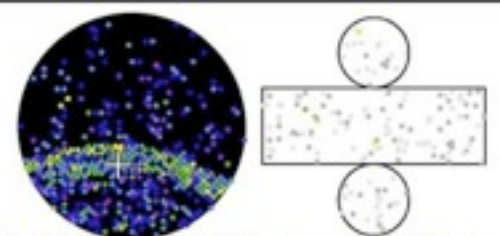
Run: 1757 Sub: 4 Ev: 25716
 96-06-02-07:01:37
 Doser: 1949 kVh, 5263 μ C
 Doser: 4 kVh, 55 μ C (in-time)
 Trigger ID: 0x0
 S well: 475.4 cm
 PC no-106a, p = 418.1 96/07

Charge (pe)

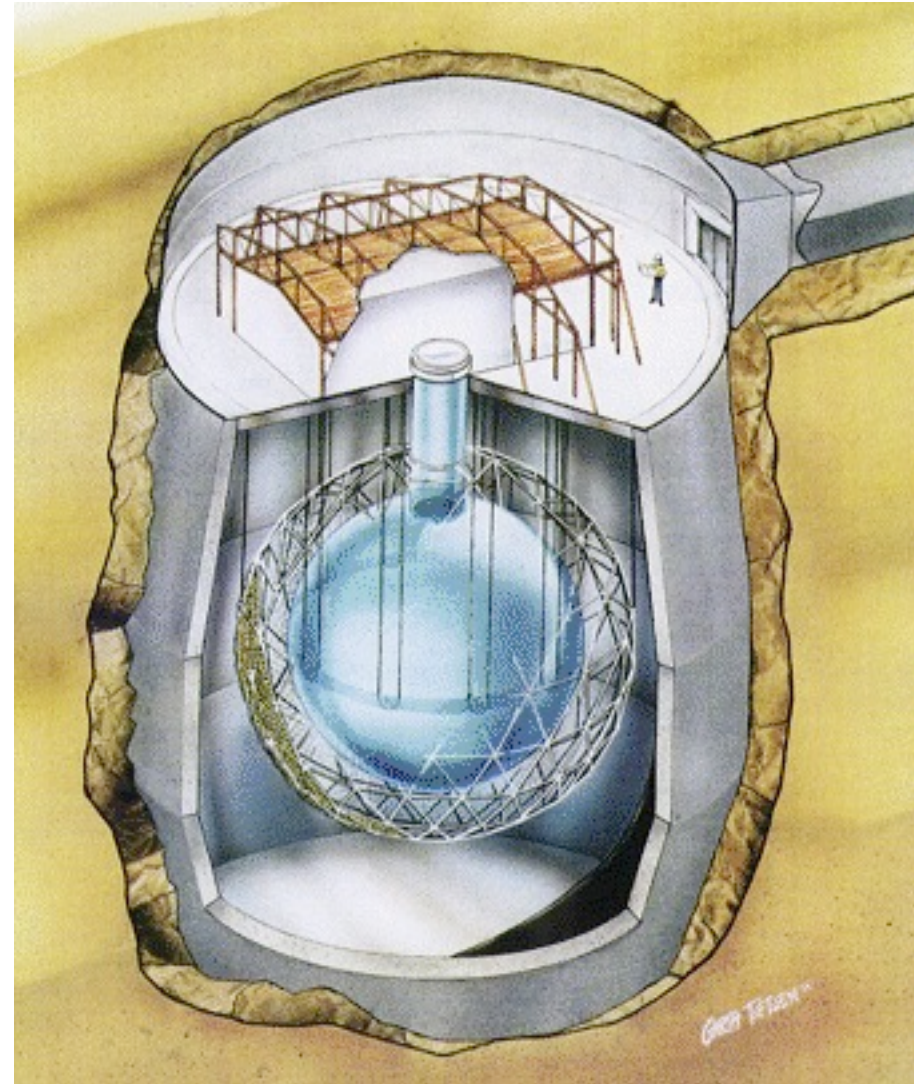
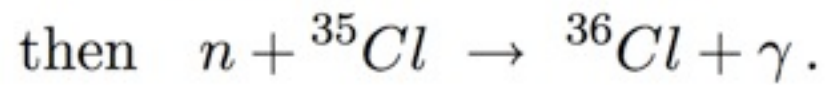
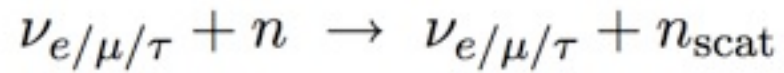
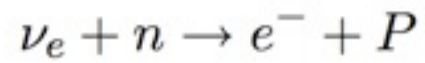
- >24.7
- 21.3-24.7
- 18.0-21.3
- 14.7-18.0
- 11.3-14.7
- 8.0-11.3
- 4.7-8.0
- 1.3-4.7
- 0.0-1.3
- -3.3-1.3
- -6.7-1.3
- -10.0-1.3



(c) Super-Kamiokande Collaboration



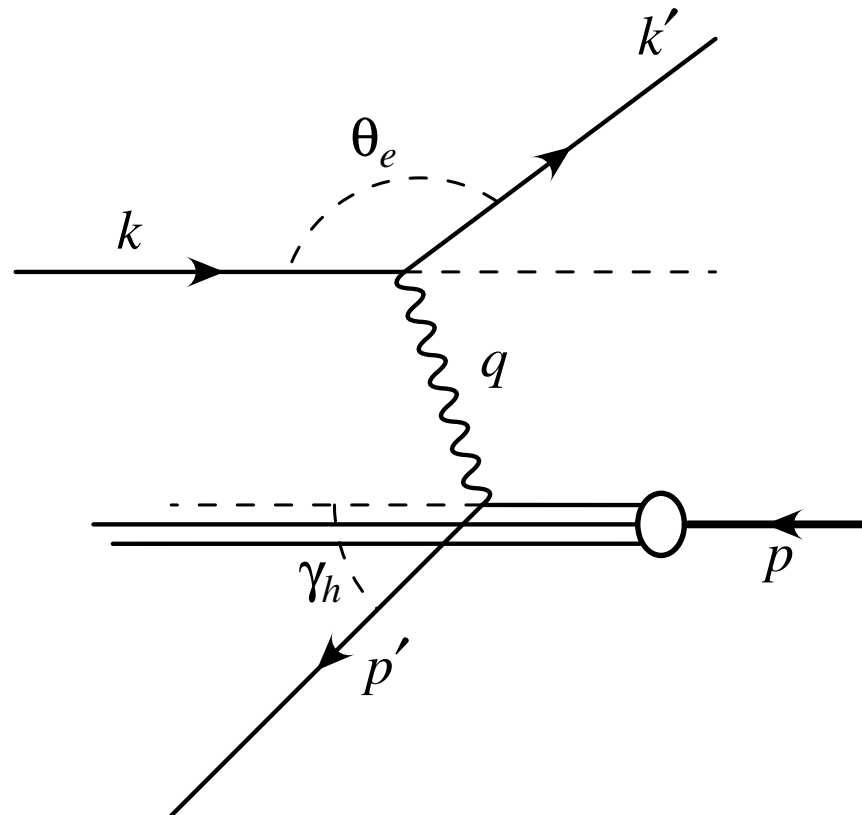
SNO



High energy colliders (and fixed-target)

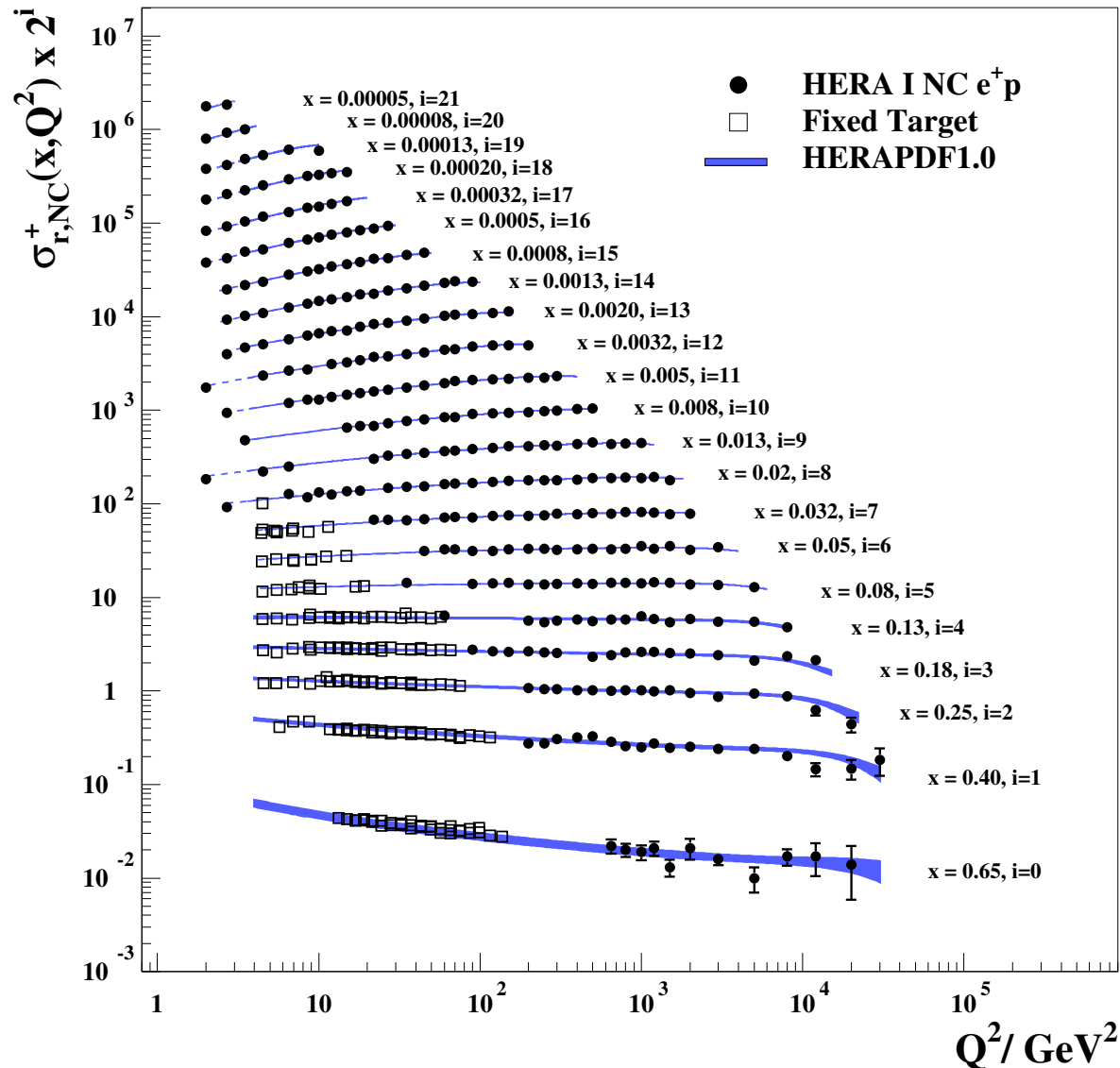
1. e^+e^- : purely leptonic, controlled centre-of-mass energy, clean. Discovery potential and precision physics. Limited by synchrotron radiation; need linear collider.
2. $NN(pp)$: highest energy and largest discovery potential. Messy.
3. IN : mixture of the two. One probe and one structured object.

Deep inelastic scattering

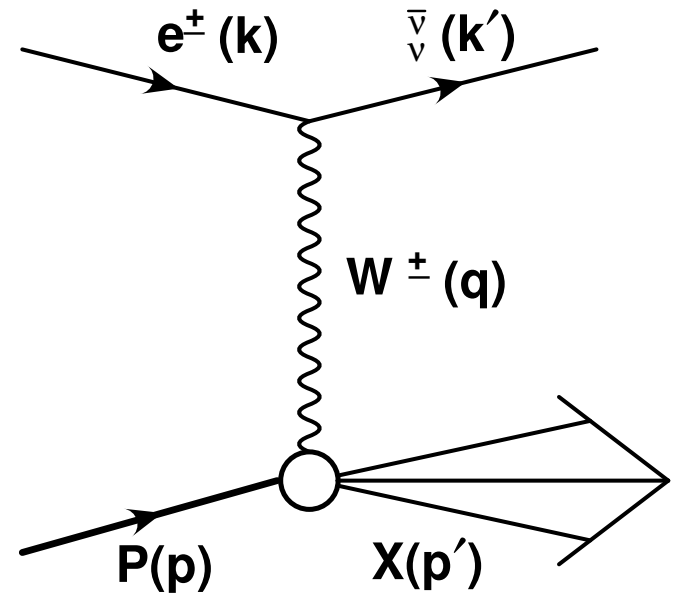
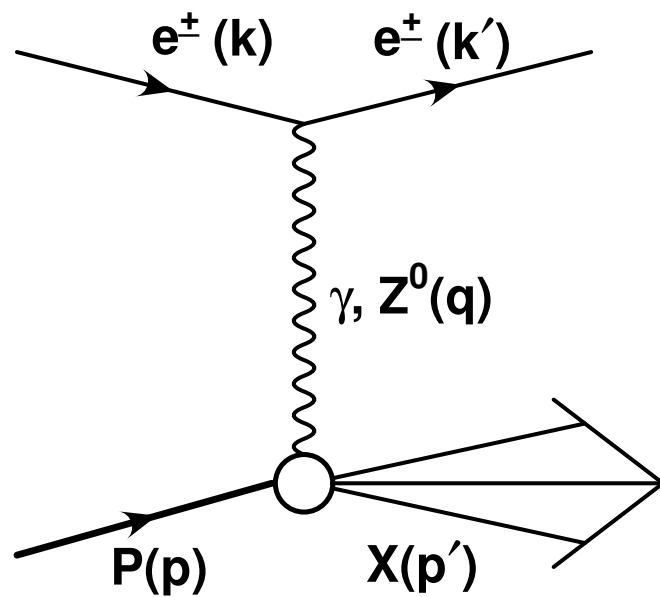


The structure of the proton

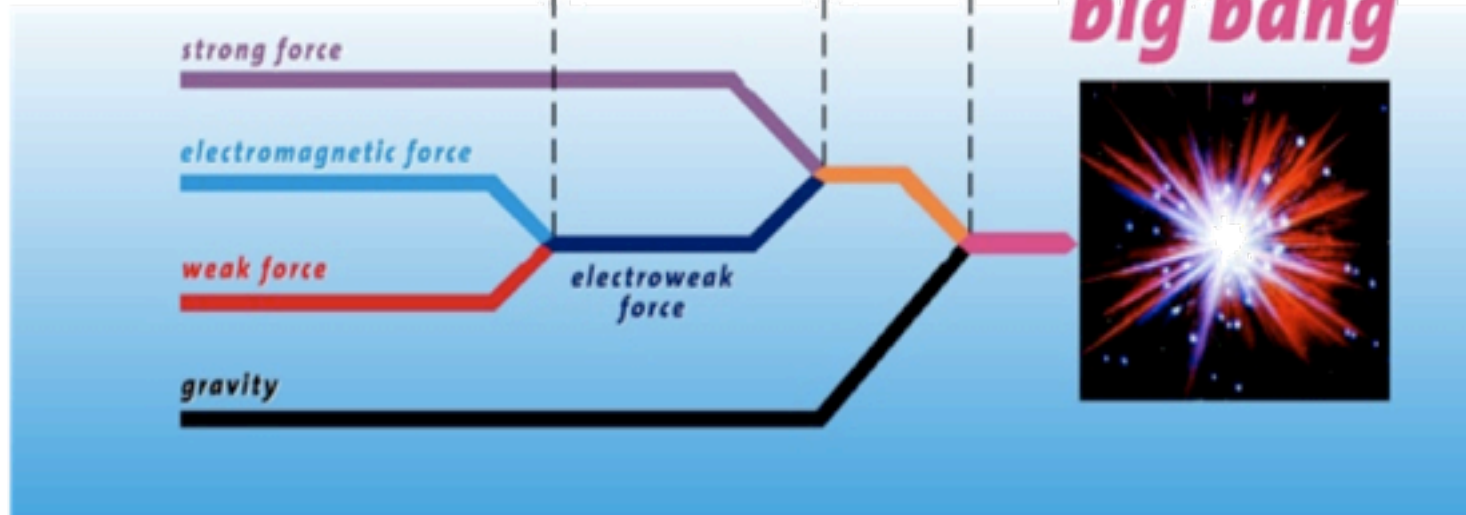
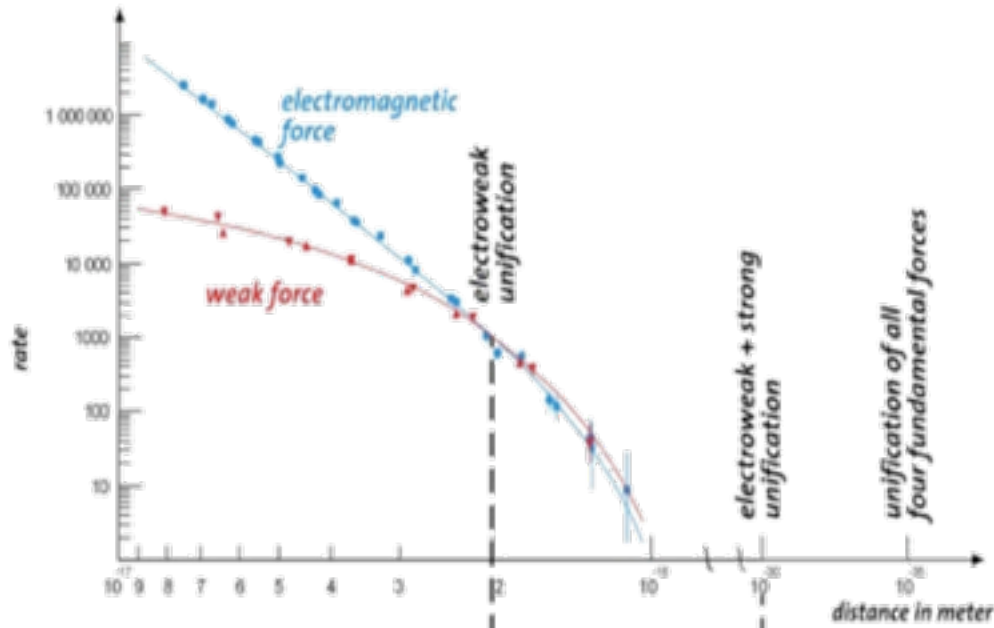
H1 and ZEUS



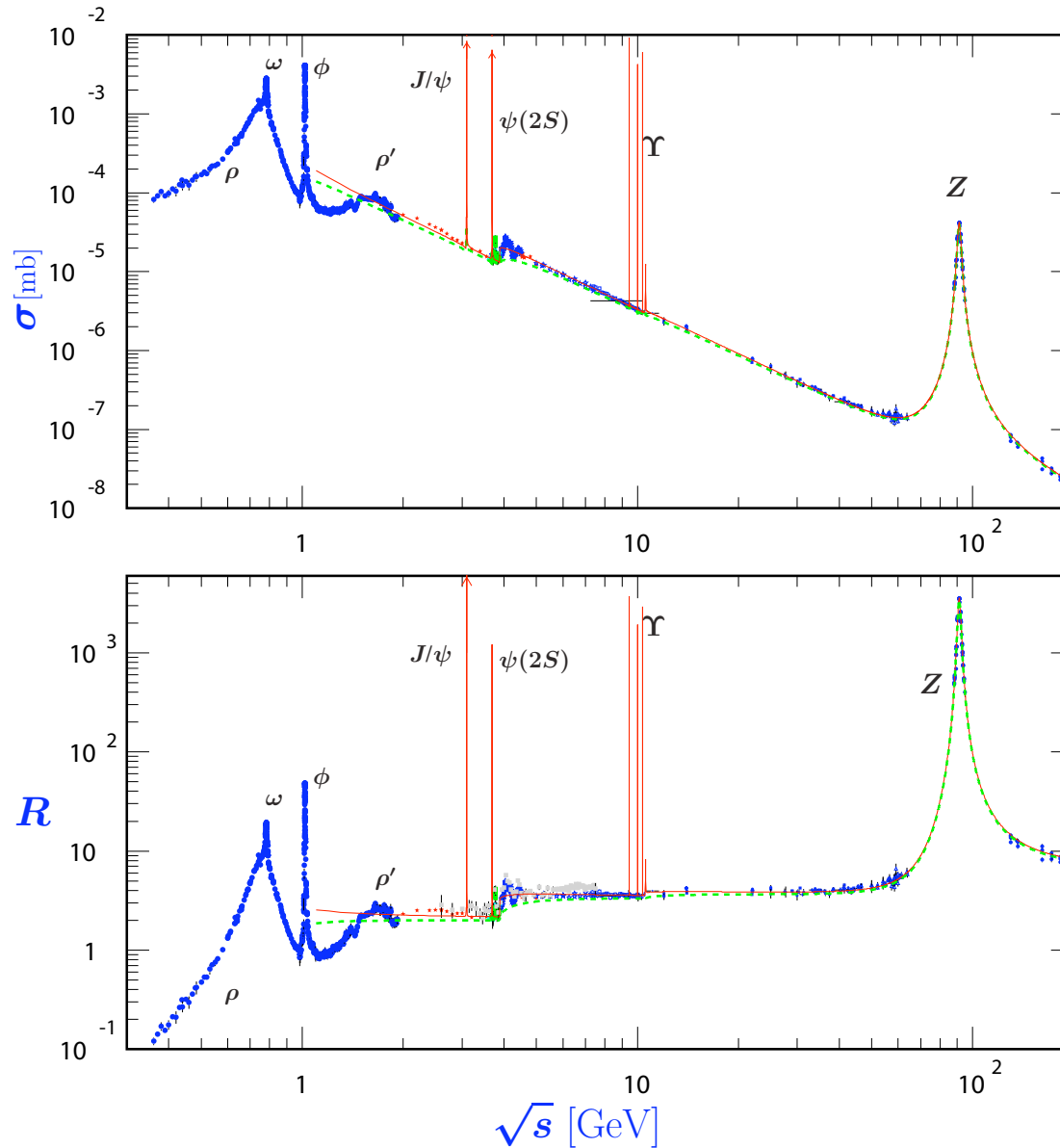
Neutral and charge current reactions



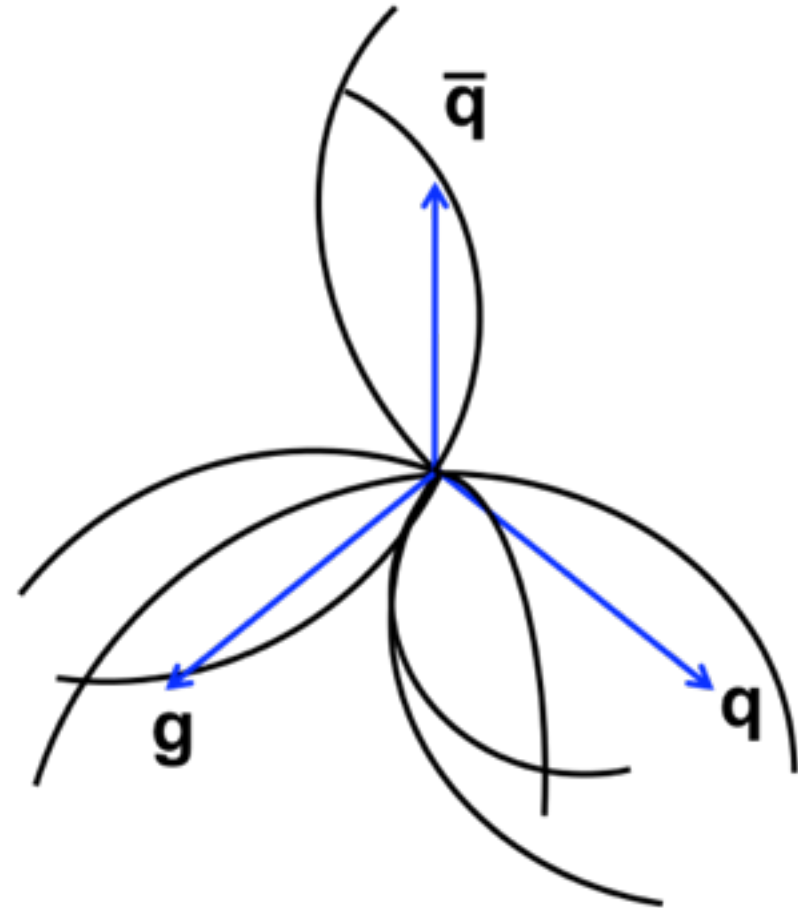
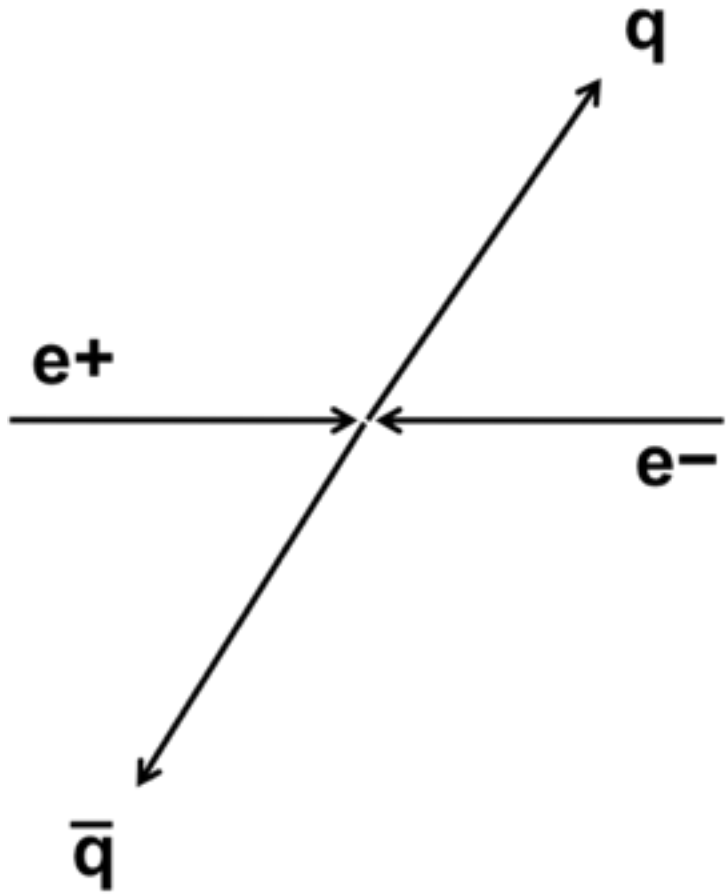
Electroweak unification



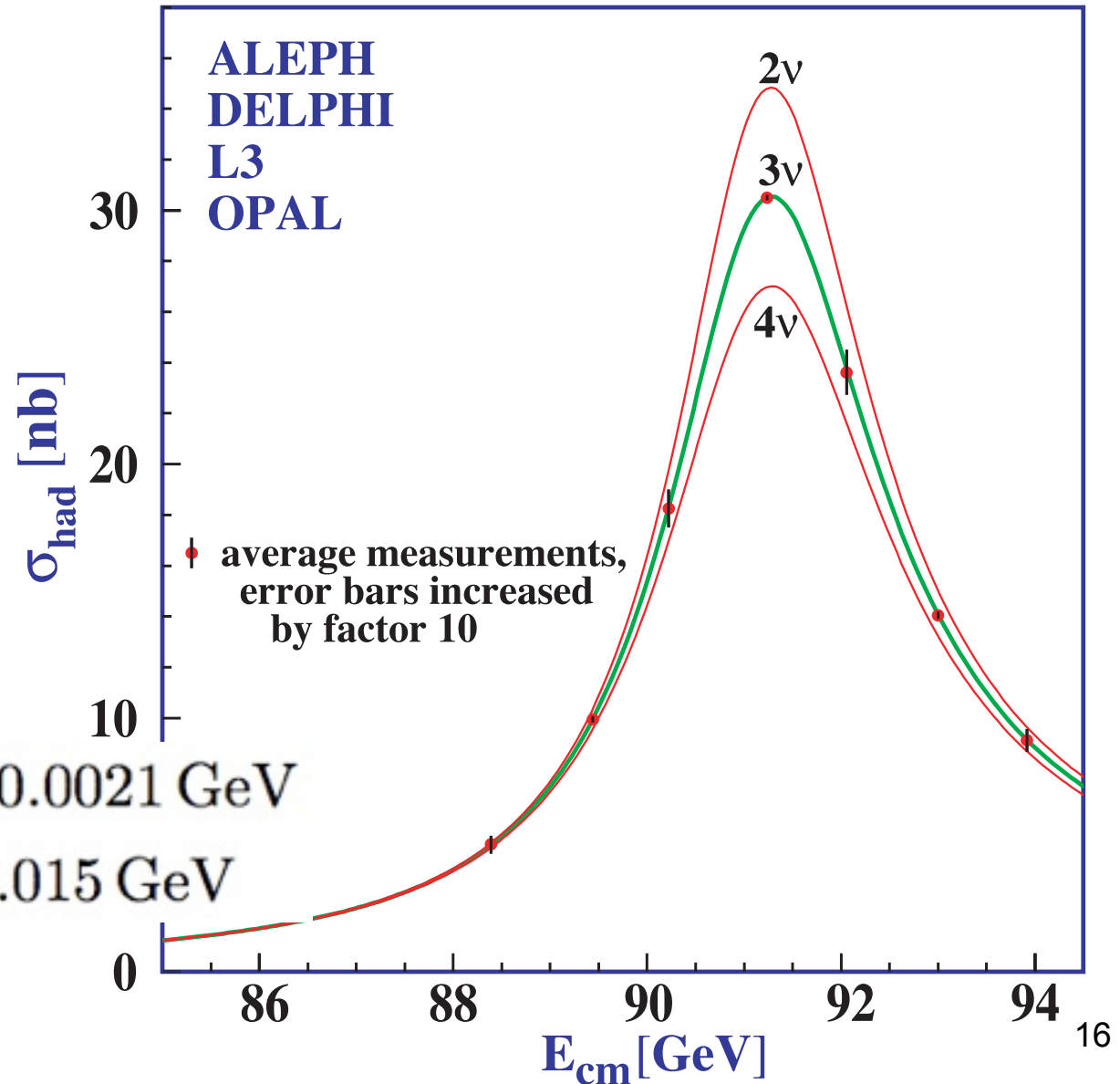
e^+e^- colliders



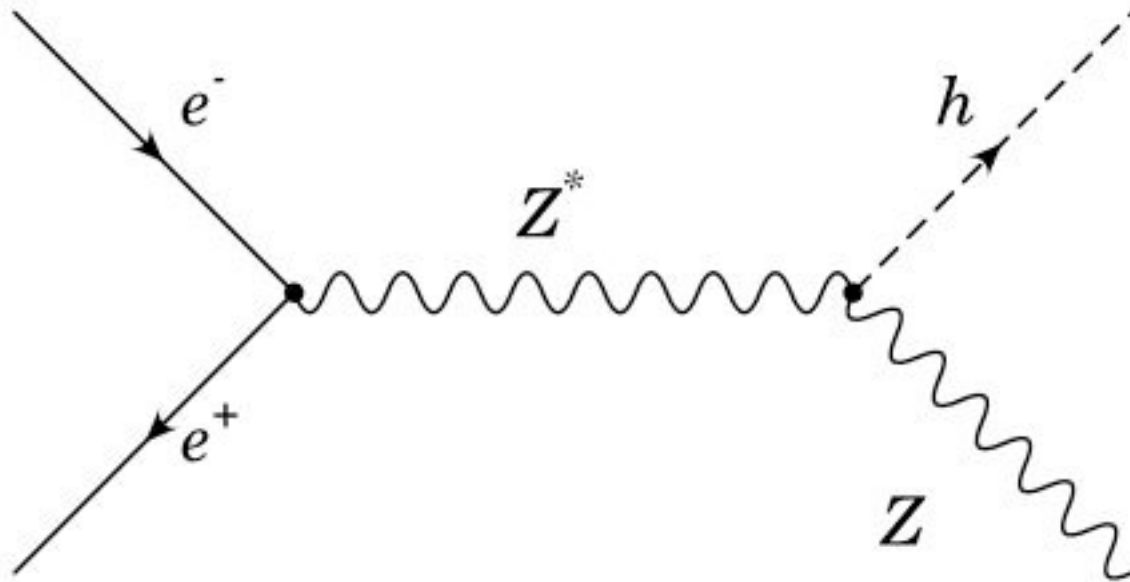
Discovery of gluon



The Z pole and three neutrinos

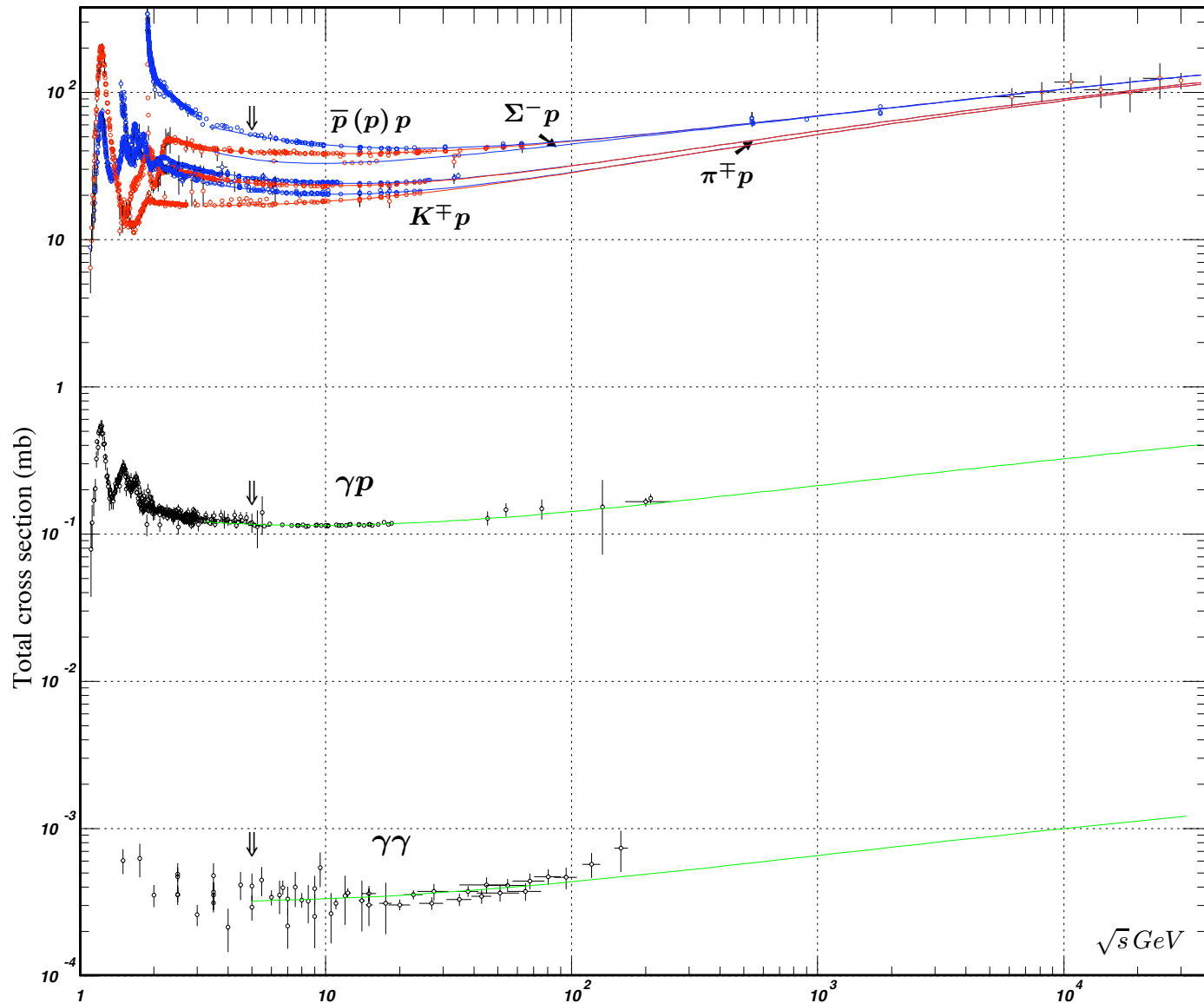


Search for the Higgs Boson

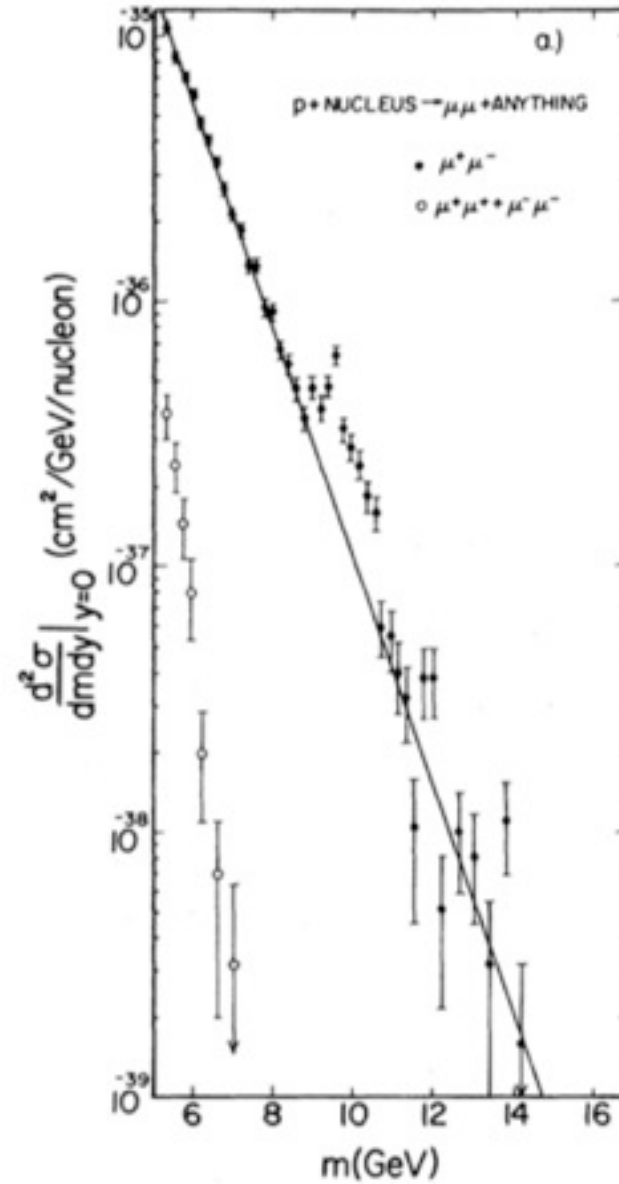


$$\sqrt{s} > M_H + M_Z$$

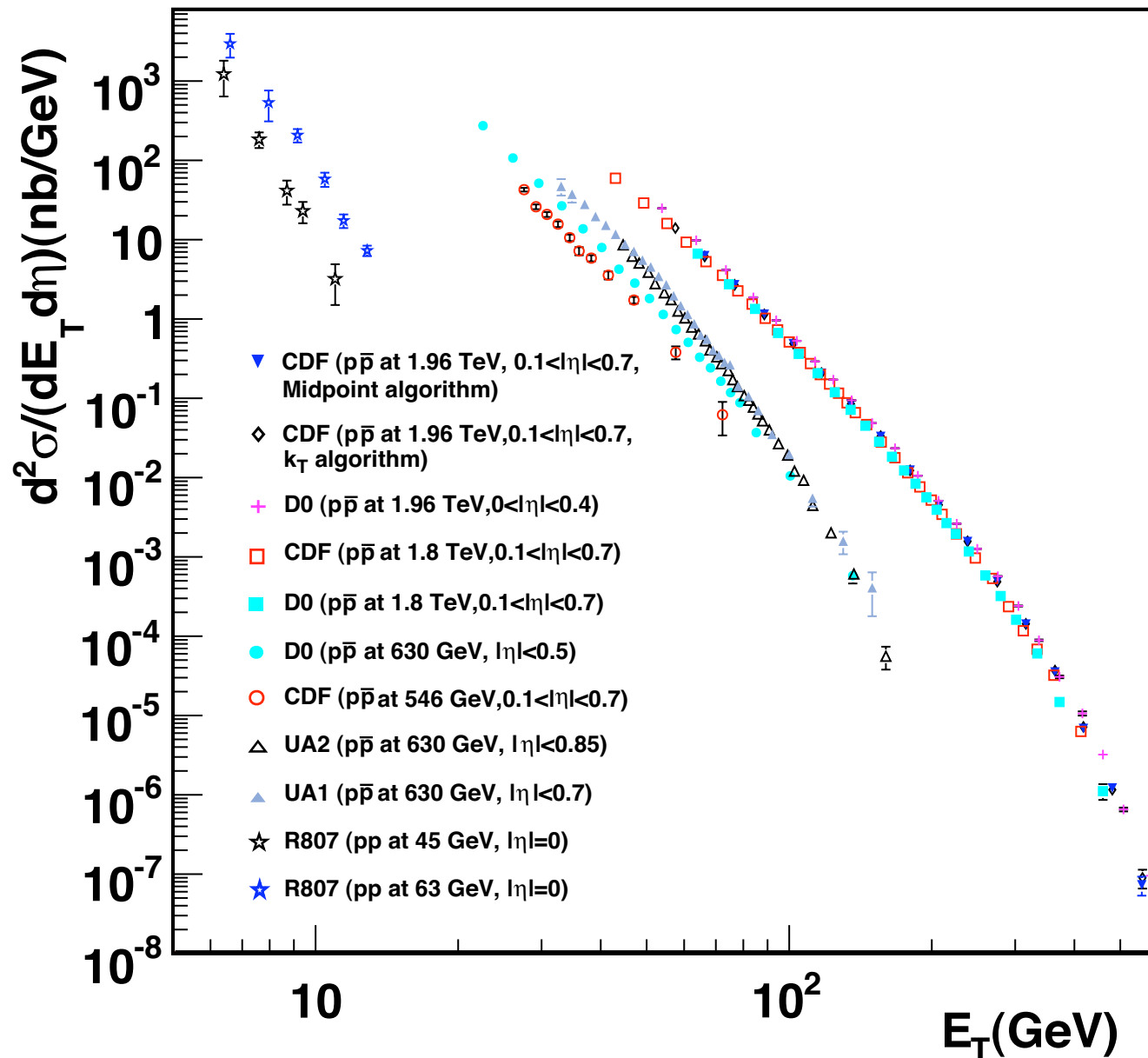
Total cross sections



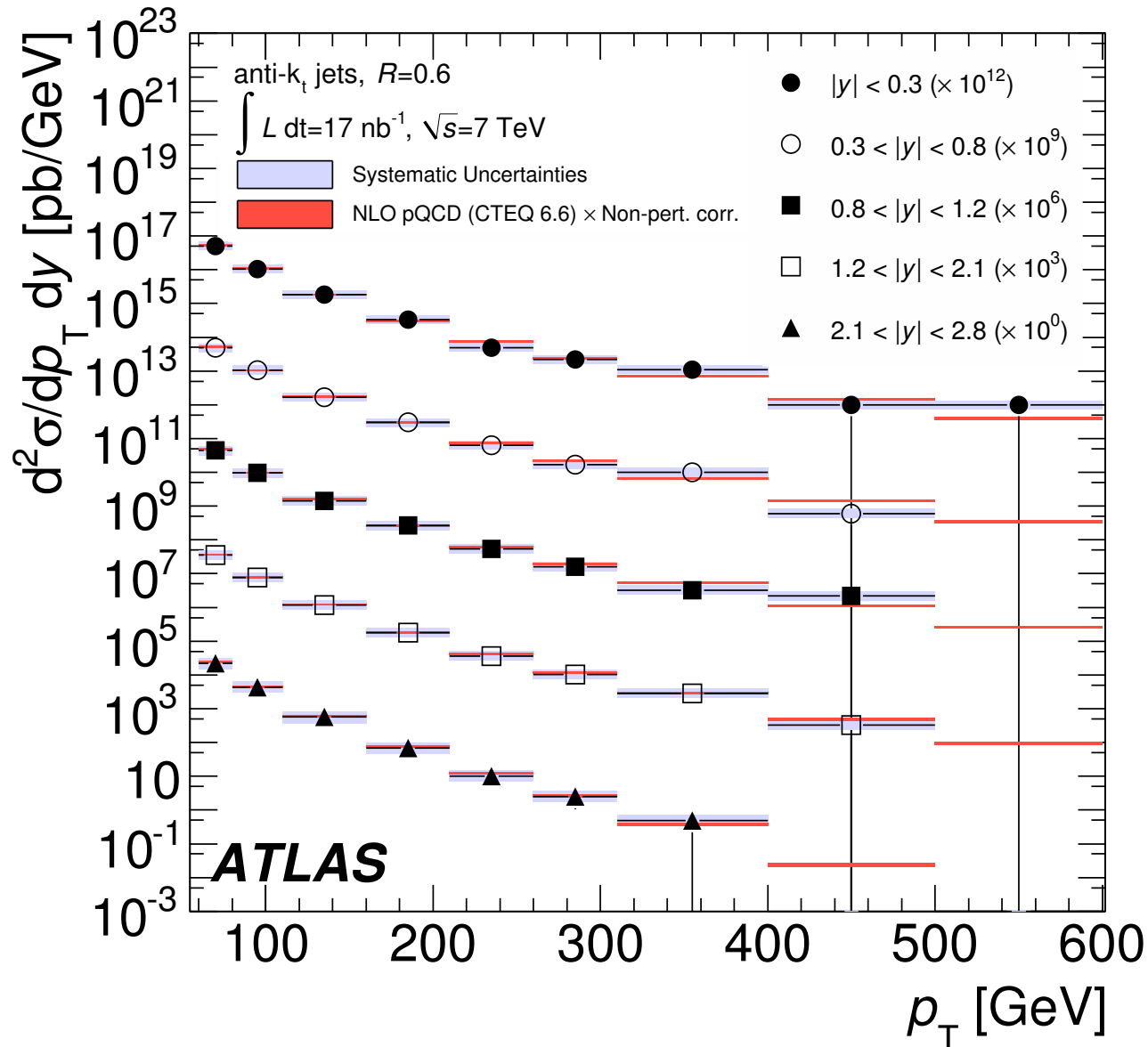
Discovery of bottom quark



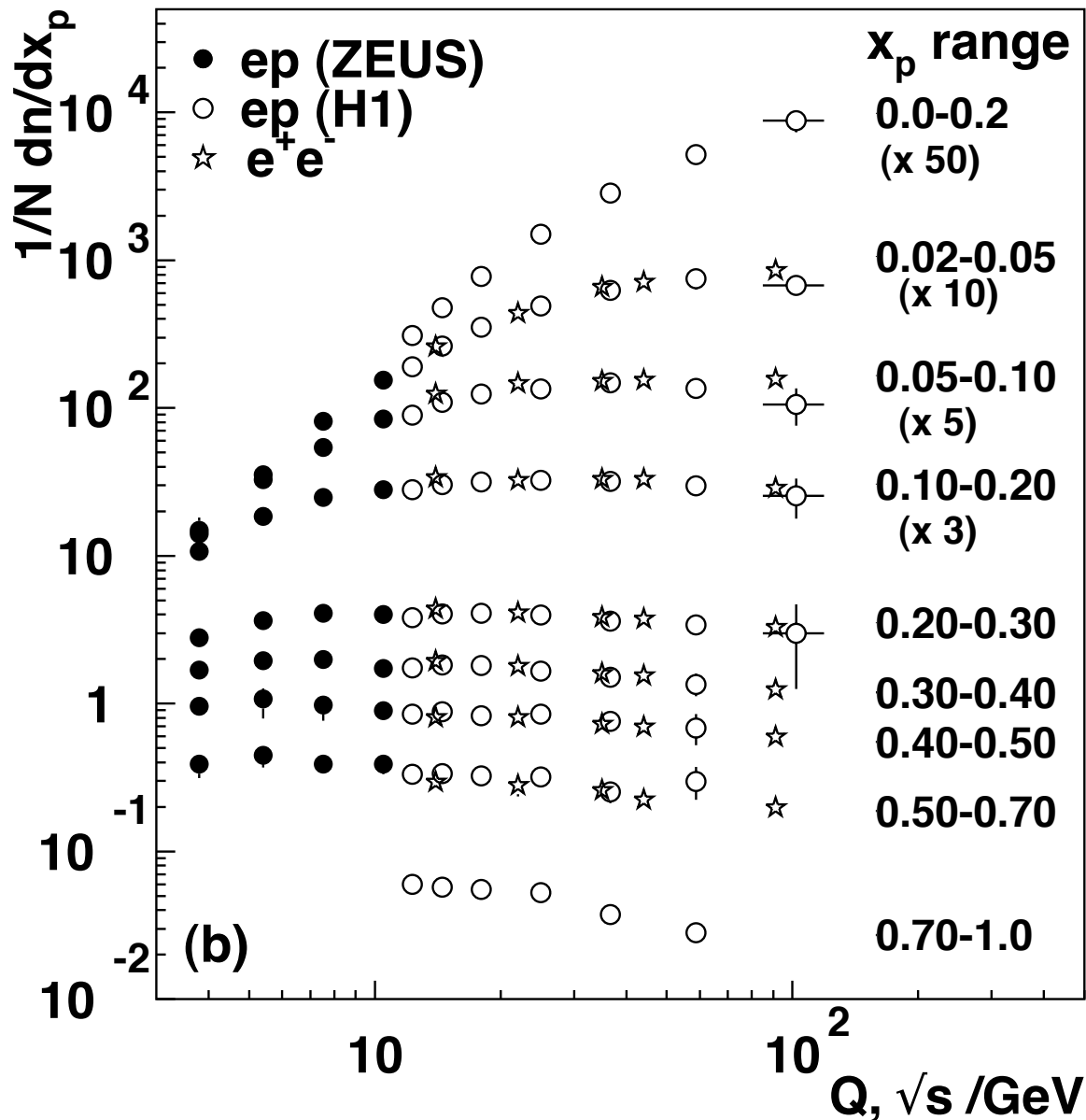
Inclusive jet cross section



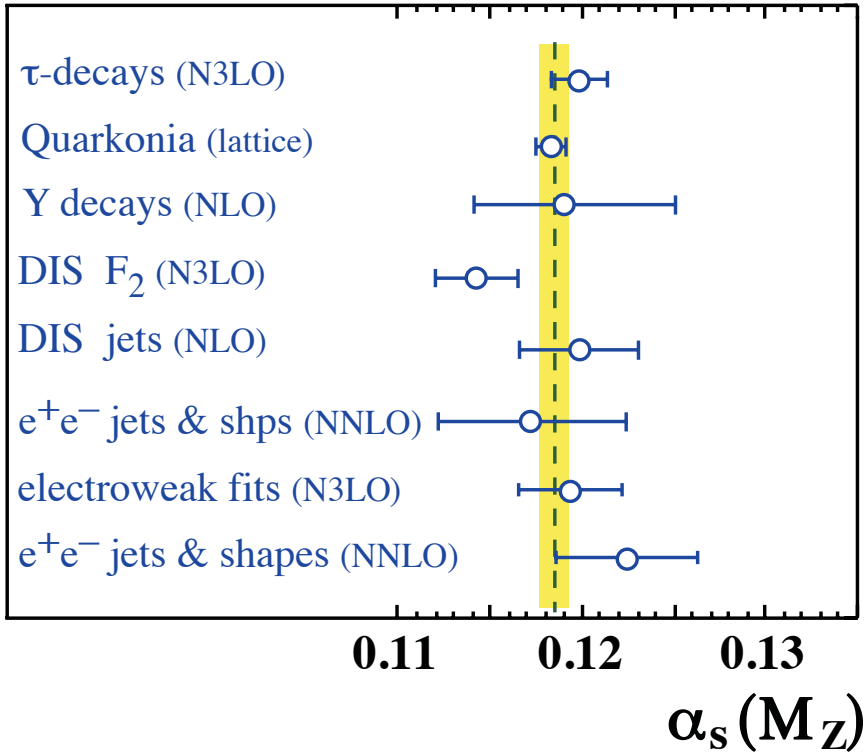
Inclusive jet cross section



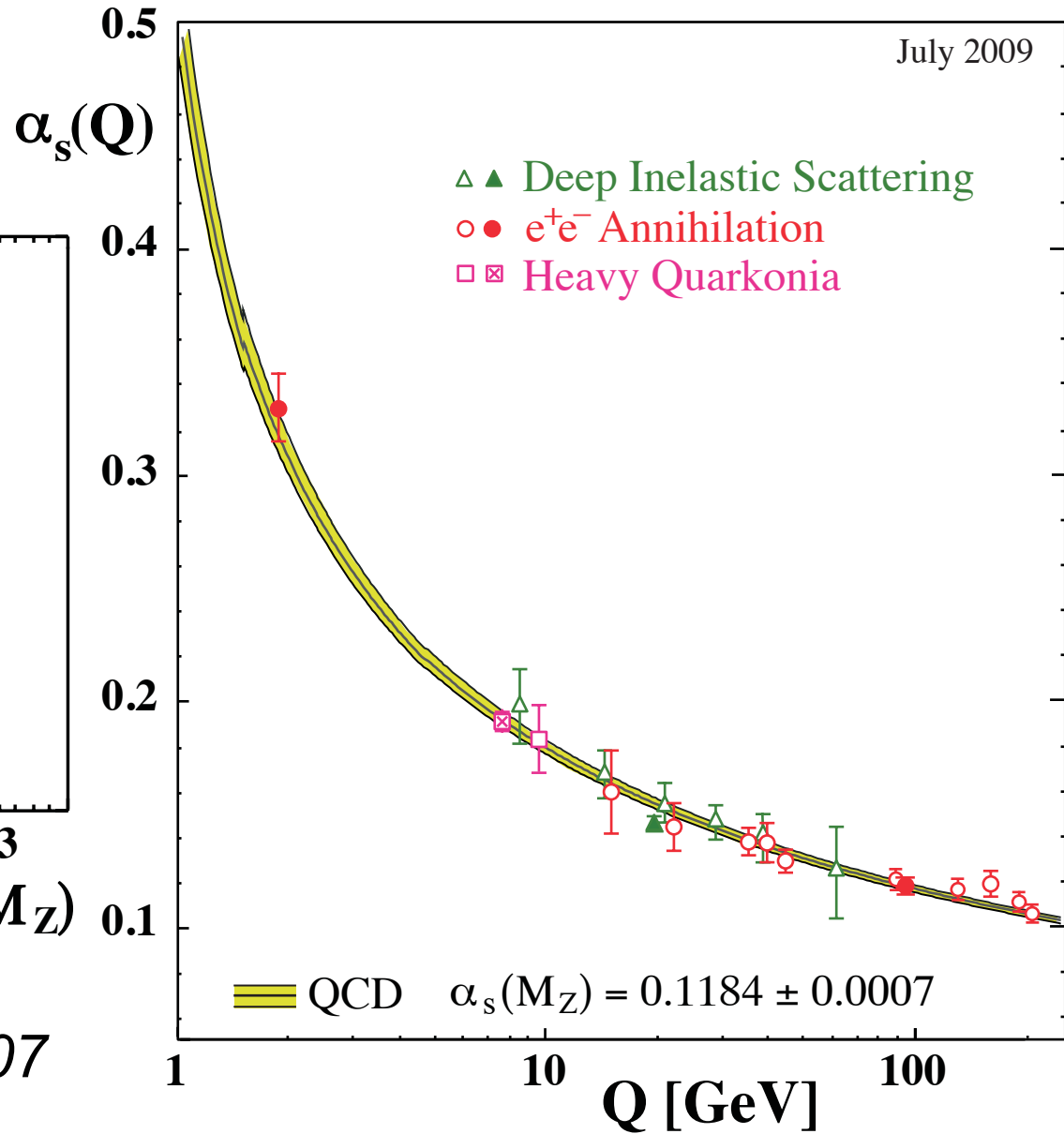
Fragmentation universality



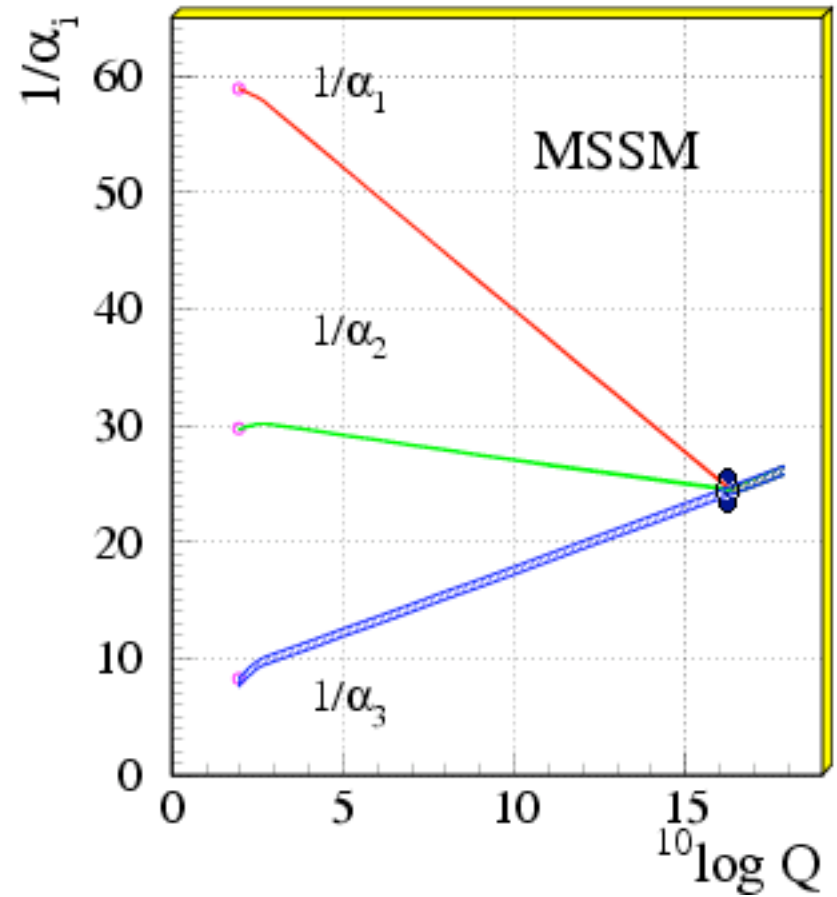
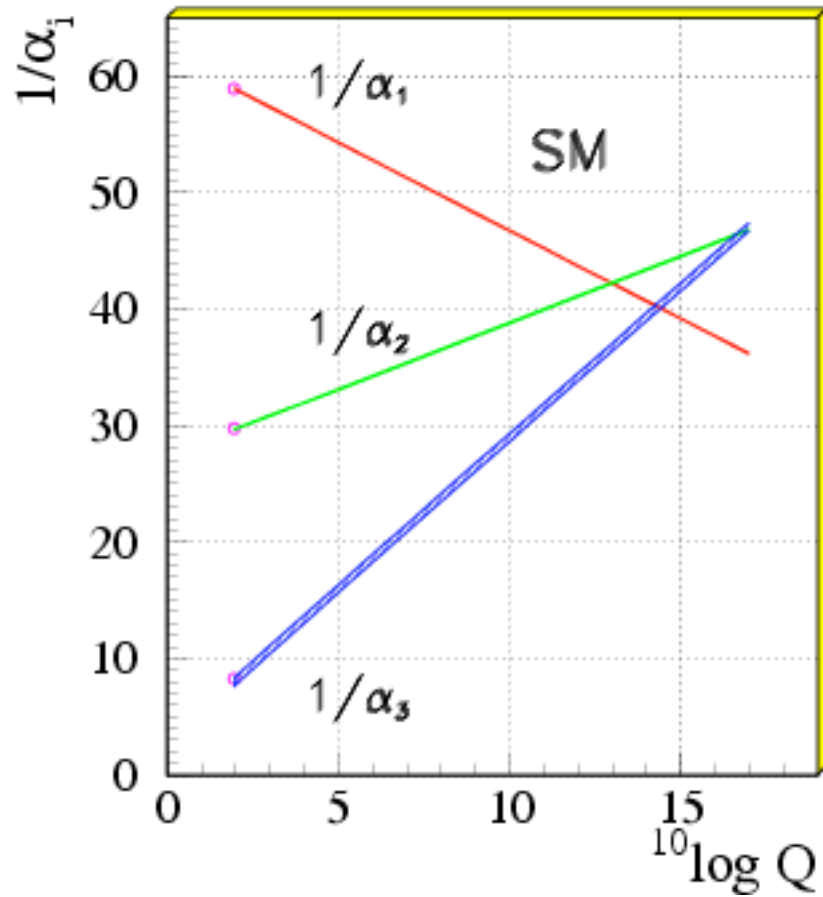
Combination : α_s



$$\alpha_s(M_Z) = 0.1184 \pm 0.0007$$



Grand unification



Higgs search

