



Phenomenology of Particle Physics II

Exercise Sheet 4

ETH
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www.itp.phys.ethz.ch/education/lectures_fs12/PPPII

Please read the following articles and answer the related questions:

- H.W. Kendall, *Deep inelastic scattering*
<http://www-hep2.fzu.cz/~chyla/talks/others/kendall.pdf>
- E.D. Bloom *et al.*, *High-Energy inelastic e-p scattering at 6 and 10 degrees*, Phys. Rev. Lett. **23**, 16 (1969) 30-934.
http://prl.aps.org/pdf/PRL/v23/i16/p930_1

Exercise 4 [*Experimental details*]

- (i) How were the main experimental detectors used to perform the measurements?
Hint: Magnetic spectrometer, hodoscopes (scintillators), pion-electron separation system (scintillation counter, Cerenkov counter)
- (ii) How can one justify an experimental setup where only the scattered electrons but not the hadronic recoil system (the pions) were detected? With what accuracy the electron parameters are measured?
- (iii) What was the most important result of the reported measurement?
Hint: Summarize in your own words what one sees in Figure 10, 11 and 13 of Kendall's article.
- (iv) Assume to be “beamed back” to 1965 and that you could design a new DIS experiment with today's detection technology for a 20 GeV e-p scattering, but only with the theoretical knowledge of that time. What knowledge could in principle be obtained from the DIS scattering with electron beam energies up to 21 GeV (and higher) and in addition to what was learned from the SLAC DIS experiment?
Hint: Modern detectors could provide detailed informations about the hadronic recoil system and measure the scattered electron essentially over the entire solid angle.

– please turn over –

Exercise 5 [*Compare different types of DIS scattering experiments*] Discuss the advantages and disadvantages of e - p , μ - p and ν - p fixed target scattering and the e - p collider experiments. *Hints: Luminosity, Q^2 , electro-weak phenomena and charged and neutral current cross sections etc.*

Informations relative to the exercises

Testat condition : 60% of the exercise sheets worked out and solve one exercise at the blackboard.

Exercises may be solved in groups of up to 3 people.

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