Summary of the Informal Workshop on "Drell-Yan physics at COMPASS"

March 5th-6th Torino, Italy
summary

In this meeting was discussed the kinematical range, for DY processes, that can be covered with the Compass spectrometer and with π^- beams hitting NH_3 polarised target. The conclusion is that we have to cover the region for valence quarks with $x-$ Bjorken $x_{1,2} \geq 0.1$.

For the continuum region of the dilepton masses larger than the J/ψ and $\psi^{'}$ resonances ($4.GeV \leq M_{ll} \leq 9.GeV$), the so-called safe region, higher twists are expected to be small and the perturbative QCD fully applicable. The cut on transverse momentum of dilepton pair $p_T > 1.GeV$ looks valid. It has been suggested that the J/ψ region can be treated similarly, but some difficulties can arise from the not well established polarization of the J/ψ. In any case, the investigation of the J/ψ formation mechanism with polarised target at $s = 200 \div 300GeV^2$ energies would be by itself an interesting matter, due to the lack of experimental measurements in this kinematics.

At the same s but lower Q^2 the QCD corrections to DY processes are large. It has been suggested that the NLO contributions to DY spin asymmetries expected to be small because of the cancellation of K factors for both polarised and unpolarized cross sections. We can check experimentally this for the case of the valence quarks contributions.

The NLO corrections (as well as the high twist effects, at least for not too large p_T values, $p_T \leq 3GeV$) can not explain the large asymmetry observed in the angular distributions of the unpolarized DY cross sections, where an anomalously large coefficient ν of the $\cos(2\phi)$ term is observed. This corresponds to strong violation of the Lam-Tung relation. The Boer-Mulders PDF is introduced to explain that discrepancy.

Monte Carlo:

It is generally accepted that a modified version of PYTHIA is needed to generate DY processes as well as both incoherent and combinatorial background. In this perspective the elements of the Andrea Bianconi generator should be tested and implemented in the PYTHIA code.

The Compass Polarised Target group checked that the NH_3 polarised target will stand the high intensity hadron beam ($2 \times 10^7 \pi/s$) keeping the same performances as in the muon run.

The dynamical range of the SPS M2 line optics is good enough to saturate the maximal allowed by CERN safety regulations intensity of the hadron beam ($10^8 p/spill$, or $2 \times 10^7 p/s$ in the COMPASS hall) in a wide range of pion momenta $50 \div 200GeV/c$. The option of an RF separated high intensity antiproton beam for COMPASS is under study.

A test performed in 2004 with high intensity ($2 \times 10^7 \pi^-/s$) hadron beam showed a very stable detector operation.

Two different triggers are presently under consideration: one detecting the e^+e^- channel, the other one measuring the $\mu^+\mu^-$ branch. The muon trigger for the Large Angle Spectrometer of the COMPASS spectrometer is under discussion. This is a very important part of the spectrometer upgrade for DY physics. It seems that the best solution is a combined trigger, based on FPGA technique, including a large area scintillator hodoscope

and the Muon Wall detector. The possibility to use the COMPASS hadron calorimetry to reduce background is also under study. For the e^+e^- trigger the use of electromagnetic calorimeters is under consideration.

The feasibility study is definitely not completed. In parallel with Monte Carlo study, we forsee, during the summer 2007, a dedicated COMPASS Drell-Yan program test with beam. We expect that the results of this test will play a key role in further COMPASS DY program discussion.

Preliminary sharing of duties for the preparation of the Expression of Interest was discussed. The next meeting will be at CERN either during the COMPASS week (7-12 may 2007) or a week before. To be discussed via e-mail.