



Dr. Oleg Denisov, INFN section of Turin, Italy

### Forthcoming Drell-Yan experiment at COMPASS

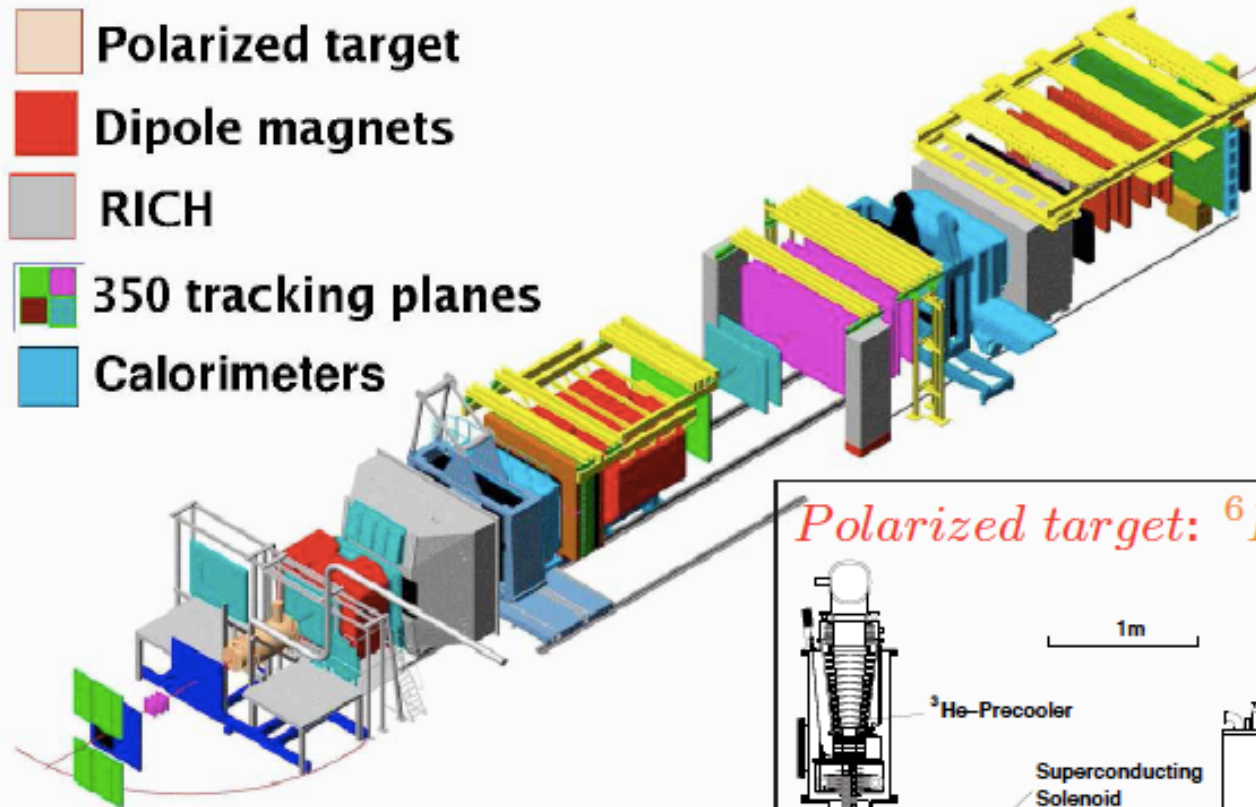
The COMPASS experiment at CERN is a universal facility which can operate with both muon and hadron beams as well as with the longitudinally/transversely polarized solid target. The main goal of the experiment is to study the spin structure of the nucleon. The availability of hadron(pion) beam provides an access to the Drell-Yan physics, i.e. to the process where quark(target)-antiquark(beam) pair annihilates electromagnetically with a production of dilepton pair. Study of angular dependencies of the Drell-Yan process cross-section allows us to access parton distribution functions (PDFs) or, more precisely, a convolutions of various PDFs. The possibility to use in a future COMPASS Drell-Yan experiment a transversely polarized target together with negative pion beam will provide us with unique data on transverse momentum dependent (TMD) PDFs.

The COMPASS-II proposal [1], which includes the single-polarized Drell-Yan measurements, was submitted to the CERN SPS committee in May 2010, was recommended by SPSC for approval in September 2010 and approved by CERN research board in December 2010. In this presentation the most important features of the Drell-Yan experiment at COMPASS will be discussed. The experimental set-up, its performance including apparatus acceptance and kinematic range coverage as well as projections for the achievable statistical errors on various single-spin-asymmetries will also be reported.

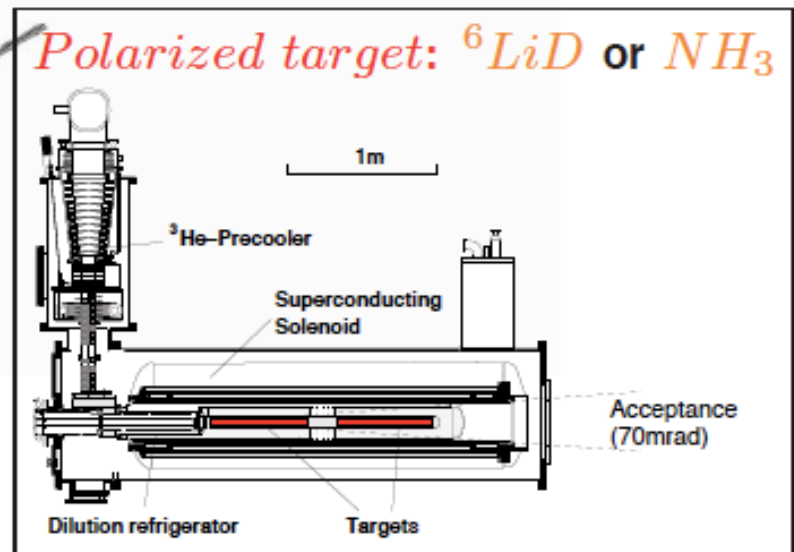
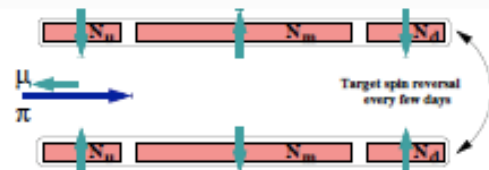
[1] COMPASS Coll., COMPASS-II proposal, CERN-SPSC-2010-014, SPSC-P-340, May 17 2010



# COMPASS facility at CERN



$\mu$  or  $\pi$  beam





## COMPASS-II (New Physics) a piece of history



- COMPASS is very sophisticated, universal and flexible facility → Physics beyond SIDIS and hadron spectroscopy is possible:
  - Unique COMPASS Polarised Target
  - Both hadron and lepton beams
  - Easy-accessable spectrometer components
- All that all together has generated new physics proposals with COMPASS – DVCS(GPDs) and polarised DY:
  - For the first time these ideas (GPD and DY) were reported at the Villars SPSC meeting in September 2004
  - Since then (DY part) 3 International Workshops (Torino, Dubna, CERN), > 40 COMPASS DY subgroup meetings, 3 Beam Tests, > 20 presentations at the international Conferences....
- The COMPASS-II proposal is submitted to the SPSC on May 17<sup>th</sup> 2010
- Approved by the CERN research board on December 1<sup>st</sup> 2010
- April 7<sup>th</sup> – the Collaboration took a decision to run first the DY program and then DVCS (GPDs) program – we will start in 2013 (beam test) and in 2014 we will have a full year of DY data taking.

# COMPASS-II: a Facility to study QCD



**COMMON**  
**MUON** and  
**PROTON**  
**APPARATUS** for  
**STRUCTURE** and  
**SPECTROSCOPY**

## Long Term Plans for at least 5 years (starting in 2012)

- ✓ Primakoff with  $\pi$ , K beam  $\rightarrow$  Test of Chiral Perturb. theory
- ✓ DVCS & DVMP with  $\mu$  beams  $\rightarrow$  Transv. Spatial Distrib. with GPDs
- ✓ SIDIS (with GPD prog.)  $\rightarrow$  Strange PDF and Transv. Mom. dep. PDFs
- ✓ Drell-Yan with  $\pi$  beams  $\rightarrow$  Transverse Momentum dependent PDFs

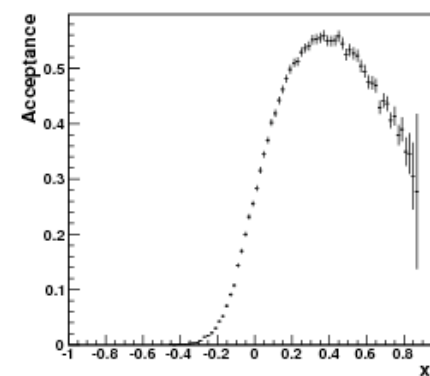
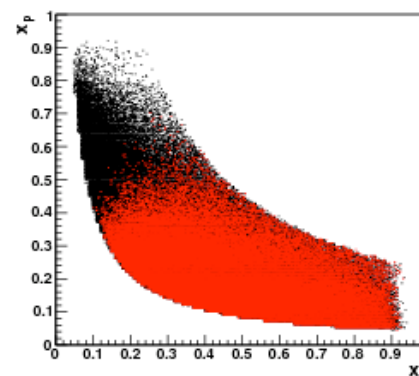
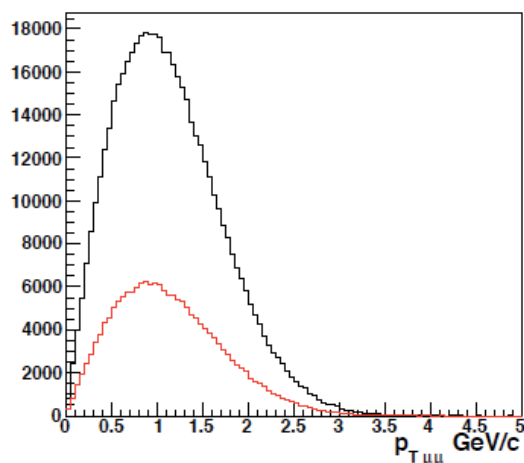
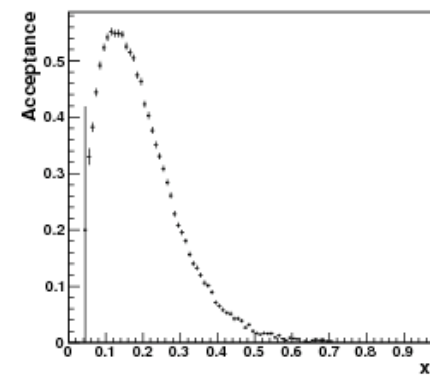
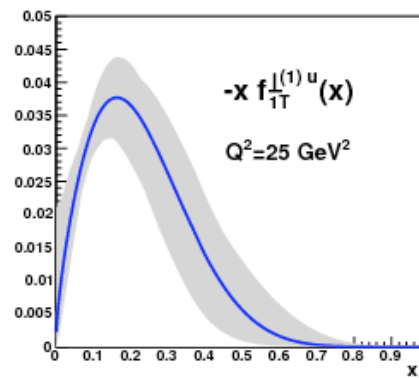


# DY@COMPASS – kinematics - valence quark range

## $\pi^- p \rightarrow \mu^- \mu^+ X$ (190 GeV pion beam)



- In our case ( $\pi^- p \rightarrow \mu^- \mu^+ X$ ) contribution from valence quarks is dominant
- In COMPASS kinematics  $u$ - $\bar{u}$  dominance
- $\langle P_T \rangle \sim 1 \text{ GeV}$  – TMDs induced effects expected to be dominant with respect to the higher QCD corrections





# DY@COMPASS projections – Sivers asymmetry



(HMR):  $4. \leq M_{\mu\mu} \leq 9. \text{ GeV}/c^2$

