

20th COMPASS Analysis Phase international mini- workshop (COMAP-XX)

5 October 2026 - 6 October 2026

CERN

Scientific Programme

The 20th COMPASS “Analysis Phase” International Mini-Workshop will be devoted to the present status and future prospects of polarized Drell-Yan measurements and to their role in advancing our understanding of the transverse-momentum-dependent structure of the nucleon.

A principal objective of the workshop will be to reassess the scientific status of polarized Drell-Yan measurements in the context of the QCD TMD framework. In particular, we will discuss whether some of its most characteristic predictions, most notably the process dependence and the predicted sign change of time-reversal-odd TMD parton distributions between semi-inclusive deep-inelastic scattering and Drell-Yan processes, remain central and experimentally unresolved questions.

The discussion will start from the present experimental and phenomenological situation. Existing SIDIS and Drell-Yan measurements have already provided important information on transverse-spin and transverse-momentum-dependent effects. A key question is therefore whether the presently available data provide sufficiently precise and conclusive tests of the expected universality properties of TMD distributions, or whether substantial ambiguities and uncertainties remain. Particular attention will be given to the experimental precision, kinematic coverage, flavour sensitivity, and theoretical control required for stringent tests of the TMD framework.

The workshop will then address the future experimental landscape. Which polarized Drell-Yan measurements are already planned? Which additional measurements would be most valuable? Which beam and target configurations can provide genuinely new information rather than simply increasing the existing data sample?

Different Drell-Yan channels probe complementary aspects of nucleon structure. Polarized proton-proton measurements provide particularly important information on sea-quark contributions and can significantly improve our understanding of the flavour structure of spin-dependent TMD distributions. Pion-nucleon Drell-Yan, on the other hand, provides particularly direct access to the valence-quark region. This is of special relevance for tests such as the predicted sign change of time-reversal-odd TMD distributions, where the effect is expected to be most clearly accessible in the valence region.

The programme will therefore compare the physics reach and complementarity of the different experimental approaches, with the aim of identifying which channels and observables could have the strongest scientific impact. An important part of the discussion will be to understand which questions cannot be fully answered by the existing data and which future measurements would provide the decisive additional information.

Particular attention will be devoted to pion-induced Drell-Yan measurements. High-energy pion beams are available at the CERN M2 beamline, the location where the COMPASS experiment carried out its extensive programme of hadron-structure measurements and where its successor experiment, AMBER, is now operating. The unique beam capabilities of the M2 line, together with the accumulated experimental infrastructure and expertise, make CERN a natural location for considering a future programme of polarized pion-induced Drell-Yan measurements.

The workshop will therefore examine whether a new polarized Drell-Yan programme at the M2 beamline could provide sufficient precision and kinematic reach to make a significant or even decisive contribution to tests of TMD universality and process dependence, particularly in the valence region. Such a programme will be discussed in the context of ongoing and planned measurements elsewhere, in order to assess its complementarity and its possible role within a broader global strategy.

By bringing together experimentalists, theorists, and phenomenologists, the workshop aims to clarify which scientific questions remain open, what can already be concluded from existing measurements, which future measurements are most needed, and how the different experimental approaches can be combined into a coherent programme for precision studies of nucleon spin and three-dimensional hadron structure.

The workshop will also contribute to the activities of the COST Action SHARP, promoting collaboration, exchange, and coordination within the broader hadron-structure community.