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## AMBER: a new QCD facility at the CERN SPS M2 beam line

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AMBER is a newly proposed fixed-target experiment at the M2 beam line of the SPS, devoted to various fundamental QCD measurements, with a Proposal recently approved by the CERN Research Board for a Phase-1 program and a Letter of Intent made public for a longer term program.

Such an unrivaled installation would make the experimental hall EHN2 the site for a great variety of measurements to address fundamental issues of strong interactions in the medium and long-term future.

The elastic muon-proton scattering process, using high-energy muons, is proposed as a novel approach to the longstanding puzzle of the proton charge radius. Such a measurement constitutes a highly-welcomed complementary approach in this area of world-wide activity.

Operating with protons, the largely unknown antiproton production cross section can be measured, which constitutes important input for the upcoming activities in the Search for Dark Matter.

Especially the world-unique SPS M2 beam line, when operated with high-energy pions, can be used to shed light to the emergence of hadron masses. How can we explain the emergence of the proton mass and the nearly masslessness of the pion? The origin of hadron masses is deeply connected to the parton dynamics, and how it differs in protons or mesons.

For a longer-term program an upgrade of the M2 beam line with radio-frequency separation of kaon and antiproton beams of high energy and high intensity would allow for further unique opportunity to shed new light to the light meson structure and spectroscopy.

The rich physics program planned at the AMBER experiment will be presented. World competition and possible timelines will be discussed.

### In-person participation

Yes

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