Physics with Hadronic Probes at COMPASS

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The existence of color-neutral hadrons with gluonic degrees of freedom is a fundamental consequence of the non-abelian structure of QCD, which therefore predicts a spectrum of hadrons much richer than that of the constituent quark model. On the experimental side, however, observations of mesonic states outside the $q\overline{q}$ model, i. e. consisting of a color octet quark - antiquark pair and an excited gluonic string ("hybrids") or of valence gluons only ("glueballs"), are heavily debated, and are still awaiting their firm confirmation. The production of states with gluonic excitations is believed to be enhanced in peripheral interactions, which proceed via the exchange of a Reggeon or a Pomeron. COMPASS is a multi-purpose fixed target detector at CERN's Super Proton Synchrotron, which aims at studying the spectrum of light mesons with masses up to $2.5\,\mathrm{GeV}/c^2$ in the next two years. Using a secondary hadron beam, and owing to its large acceptance and high resolution, both diffractively and centrally produced mesons can be studied in COMPASS. An upgraded setup optimized for the reconstruction of final states containing both neutral and charged particles allows us to study resonances in different reaction and decay channels. The prospects of this apparatus in the field of light meson spectroscopy will be discussed.

During a pilot hadron run in 2004, a competitive number of events has already been recorded with a π^- beam hitting a lead target. First results from the analysis of diffractive reactions with charged final states will be presented, providing e.g. a glimpse onto the much debated candidate for a light $J^{PC} = 1^{-+}$ hybrid, the $\pi_1(1600)$. In addition to strong interactions, electromagnetic reactions of pions and kaons in the Coulomb field of the heavy target were investigated in 2004, providing access to fundamental low-energy properties of the beam particles like their electromagnetic polarizabilities or decay constants.

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