Z0 Boson Project

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ı will use data from the D0 experiment at Fermilab to find
properties of the Z^0 boson.
file z.dat which contains real data from the D0 experimen-
ts of the 4-vectors for several thousand detected electron-
ich are believed to be from Z^0 boson decays.
his lab were selected as follows. Z0 bosons are created by the
mion-antifermion pairs. In the case of the D0 experiment
are protons and anti-protons with an energy of 900 GeV
. anti-quarks within the proton and anti-proton annihilate
n for a very short time. The Z0 boson decays via the weak
many final states, each of which consists of a fermion (spin
its anti-particle.
get are candidates for decays into the electron-positron

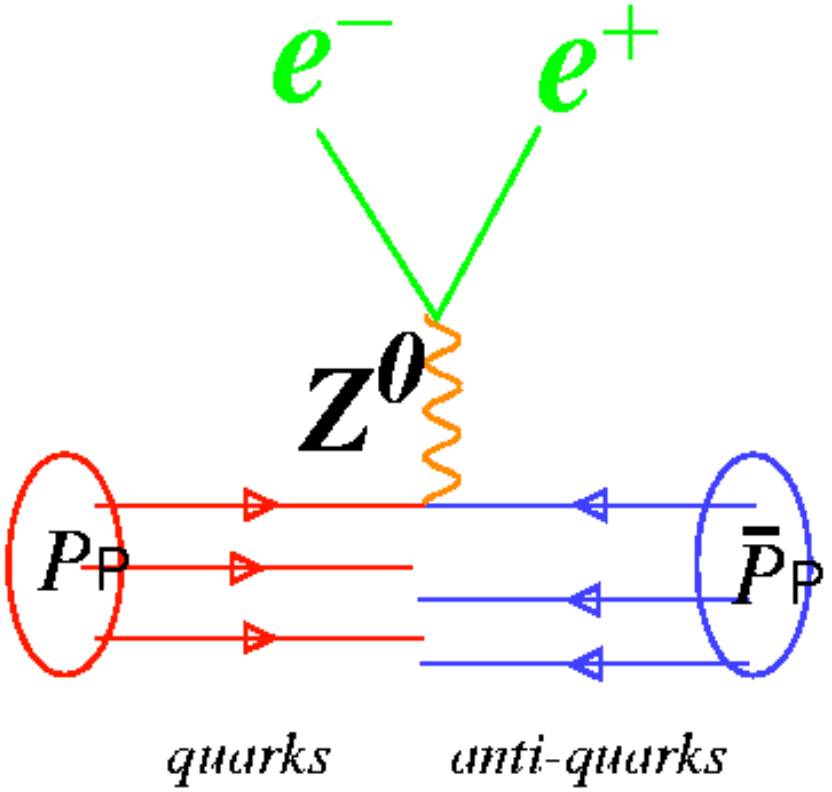

Figure 1: Production and Decay of a Z^0 boson to an electron-positron pair. A quark from a proton and an anti-quark from an anti-proton annihilating to form a Z0 boson. The Z0 boson then decays into an electron and a positron.

by the beam direction, x is horizonal and y is vertical here.) As there is no magnetic field, the electron and positron can not be told apart and the order of the particles is arbitrary.

You get the full sample of interactions with two electrons with one having $|\vec{P}| > 25 GeV/c$ and the other greater than 15 GeV/c.

1 The Z^0 and C++

You will use the Z^0 data to learn how C++ is used in a real physics environment. You will optimize the Z^0 signal, find the mass of the Z^0, measure its momentum distribution parallel and transverse to the beam and make a Monte Carlo simulation of Z^0 production which will allow you to correct for detector effects.