

(To be returned by 10:15 on Friday 31.3.)

1. At modern particle colliders, such as the LHC, luminosities (i.e. number of particles per  $\text{cm}^2$  and per second) are so high that several collision events occur during the same bunch crossing. This effect of super-imposed events is called pile-up. The vast majority of such events are so called minimum bias events, where the incoming particles just barely “scratch” each other. Study the transverse momentum and pseudo-rapidity distributions of muons in minimum bias events at the LHC ( $\sqrt{s} = 13 \text{ TeV}$ ) with a generator level simulation.
2. Assume that your muon system would detect muons with  $p_T > 5 \text{ GeV}/c$  and with  $|\eta| < 2.5$ . What is the probability that your muon system would detect a muon from a minimum bias event simulated in 1.?

Please push your answers into your public git repository.