Photoproduction of top quarks in peripheral heavy ion collisions

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Abstract

In relativistic heavy ion collisions, top quarks can be produced by photon-gluon fusion when a photon from the Weizsäcker-Williams virtual photon field of one nucleus interacts with a gluon in the other nucleus. Photoproduction with heavy ions at the Large Hadron Collider (LHC) will be the first accessible non-hadronic top production channel. We calculate the $t\overline{t}$ photoproduction cross sections, pair mass and top quark rapidity distributions in peripheral heavy ion collisions. The cross sections are sensitive to the top quark charge and the large-Q^2 gluon distribution in the nucleus. We find a cross section of 94 pb in calcium-calcium collisions, leading to 190 pairs in a one month (10^6 sec) LHC run. We also find pPb and pCa cross sections of 5.8 and 3.4 pb respectively, resulting in 6 and 34 $t\overline{t}$ pairs per month.

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