

Abstract Submitted  
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**LHC tau neutrinos: forward production by heavy quarks**<sup>1</sup> MARY HALL RENO, WEIDONG BAI, University of Iowa, MILIND DIWAN, Brookhaven National Laboratory, MARIA VITTORIA GARZELLI, Universita degli Studi di Firenze INFN, YU SEON JEONG, CERN — The LHC interaction region is a very compact source of tau neutrinos from  $D_s$  and  $B$  meson decays. For angles close to the beam direction, these prompt decays dominate neutrino production. We use next-to-leading order QCD production of heavy quarks with initial partonic  $k_T$  smearing, followed by heavy quark fragmentation and decay to neutrinos, to present a new calculation of the spectrum of neutrinos in the very forward region. For definiteness, we evaluate the number of events in a detector of 1 m radius and length of 1 m of lead target located 480 m from the LHC interaction point. With this approach, thousands of tau neutrino plus antineutrino events are predicted for an LHC integrated luminosity of  $3000 \text{ fb}^{-1}$ . The impacts on the tau neutrino energy distribution from  $k_T$  smearing and from perturbative QCD uncertainties associated with the renormalization and factorization scales are assessed in the context of comparisons with LHCb data on double differential cross sections in transverse momentum and rapidity for  $D_s$  production. We illustrate the potential for an experiment that measures tau neutrino interactions with this 480 m oscillation baseline to constrain a 3+1 active-sterile mixing scenario with a fourth neutrino mass of order tens of eV.

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