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See-saw neutrinos from string theory

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We study the possibility of realizing the neutrino seesaw mechanism in the

$E8 \times$
$E8$ heterotic string. In particular, we consider its
$Z6$ orbifold
compactifications leading to the supersymmetric standard model gauge group and matter content. We find that these models possess all the necessary ingredients for the seesaw mechanism, including the required Dirac Yukawa couplings and large Majorana mass terms. We argue that this situation is quite common in heterotic orbifolds. In contrast to the conventional seesaw of grand unified theories (GUTs), no large GUT representations are needed to generate the Majorana mass terms.

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