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R Symmetries from Heterotic Orbifold Compactifications

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We consider the string theory origin of R-charge conservation laws in heterotic orbifold compactifications, deriving the corresponding string coupling selection rule for factorizable and non-factorizable orbifolds, with prime ordered and non-prime ordered point groups. R-charge conservation arises due to symmetries among the worldsheet instantons that can mediate the couplings. Among our results is a previously missed non-trivial contribution to the conserved R-charges from the Gamma-phases in non-prime orbifolds, which weakens the R-charge selection rule. Symmetries among the worldsheet instantons can also lead to additional selection rules for some couplings. We make a similar analysis for Rule 4 or the 'torus lattice selection rule'.

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