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Electroweak physics at very high energies: splitting and showering

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The Standard Model electroweak sector exhibits some novel features at very high energies. For $E \gg v$ (the Higgs vev), the EW gauge symmetry is essentially restored and the massless splitting phenomena dominate the EW physics. Beyond the familiar gauge theory splitting functions, we discuss the emergence of additional “ultra-collinear” splitting phenomena and the violation of the Goldstone-boson Equivalence Theorem. Because the $SU(2)$ quantum numbers are explicit and observable in common physical processes, subtleties of the Bloch-Nordsieck theorem violation are discussed. We implement the EW showering and illustrate its importance by calculating a number of physical processes at high energies within and beyond the SM.

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