

# Probing Neutral Triple Gauge Couplings at the LHC, CEPC and SPPC

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We study probes of neutral triple gauge couplings (nTGCs) at the LHC, CEPC and SPPC. The nTGCs provide a unique window to the new physics beyond the Standard Model (SM) because they can arise from SM effective field theory (SMEFT) operators that respect the full electroweak gauge group  $SU(2)_L \otimes U(1)_Y$  of the SM only at the level of dimension-8 or higher. We derive the neutral triple gauge vertices (nTGVs) generated by these dimension-8 operators in the broken phase and map them onto a newly generalized form factor formulation, which takes into account only the residual  $U(1)_{em}$  gauge symmetry. Using this mapping, we derive new relations between the form factors that guarantee a truly consistent form factor formulation of the nTGVs and remove large unphysical energy-dependent terms. We then analyze the sensitivity reaches of the LHC, CEPC and SPPC for probing the nTGCs via both the dimension-8 nTGC operators and the corresponding nTGC form factors. We compare their sensitivities with the existing LHC measurements of nTGCs and with those of future colliders.

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