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Precise prediction for the W-boson mass in U(1) extensions of the standard model

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The theoretical prediction for the W-boson mass (M_W) is sensitive to physics beyond the standard model (BSM). Currently, there is a 2σ discrepancy between the standard model (SM) theoretical prediction and the measured value of M_W, obtained from the LEP 2, Tevatron and LHC experiments. Considering also the recent measurement of M_W with the CDF II detector, the discrepancy is severely aggravated and the precise determination of theoretical BSM corrections is necessary.

We perform the one-loop renormalization of particle physics models with gauge sectors extended by an extra U(1) gauge symmetry in order to compute the radiative corrections to the muon decay process. As a result, we obtain – to the best of our knowledge – for the first time in the literature a finite, gauge invariant prediction for M_W in U(1) extensions at one-loop accuracy.

In the literature only a truncated version of the prediction for M_W was available for U(1) extensions. We compare the truncated and full predictions for M_W for different sets of input parameters in order to explore the validity of neglecting several terms from the complete one-loop prediction.

The talk is based on `arxiv:2305.11931`

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