Erratum: The electro-weak couplings of the top and bottom quarks — global fit and future prospects

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ABSTRACT: In the course of follow-up work a mistake was discovered in the parameterization of the dependence of the W -boson helicity fractions in top quark decays. The dependence on two operator coefficients, $C_{\varphi tb}$ and C_{bW} , was erroneously omitted. Inclusion of this dependence leads to significantly stronger bounds on these operators from the current data and modifies also the HL-LHC prospects. The expectations for e^+e^- colliders are not affected. We present corrected results in this erratum.

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1 Corrected results

In the course of follow-up work a mistake in the parameterization of the dependence of the W -boson helicity fractions in top quark decays was discovered. The dependence on two operator coefficients, $C_{\varphi tb}$ and C_{bW} , was erroneously omitted. Inclusion of this dependence leads to significantly stronger bounds on these operators from the current LHC run 2 data and modifies also the HL-LHC prospects. The expectations for e^+e^- colliders are not affected and the conclusions of the paper remain unaltered. We present corrected results for figures 1, 2 and 4, and table 2 in this erratum.

The updated correlation matrices are provided in a Mathematica notebook in the supplementary material supplied with this erratum.

	Λ^{-2} and Λ^{-4} terms	Λ^{-2} term only
$C_{\varphi t}/\Lambda^2$	$(-17.99, -9.61), (-6.39, 0.79)$	$(-1.44, +5.34)$
$C_{\varphi Q}^3/\Lambda^2$	$(-1.61, -0.15)$	$(-0.70, +0.52)$
$C_{\varphi Q}^1/\Lambda^2$	$(-0.99, 1.39)$	$(-0.59, +0.65)$
C_{tW}/Λ^2	$(-0.34, 0.64)$	$(-0.42, +0.24)$
C_{tB}/Λ^2	$(-8.37, -2.83)(-2.00, -1.60)(-0.36, 6.36)$	$(-9.3, +38.14)$
$C_{t\varphi}/\Lambda^2$	$(-4.57, -0.23)$	$(-5.12, -0.28)$
$C_{\varphi b}/\Lambda^2$	$(-5.40, 0.20)$	$(-0.63, +0.15)$
C_{bW}/Λ^2	$(-1.56, 1.40)$	—
C_{bB}/Λ^2	$(-33.48, -6.12), (14.44, 22.76)$	—
$C_{\varphi tb}/\Lambda^2$	$(-3.09, 3.49)$	—

Table 2. The 68% probability intervals on the dimension-six operator coefficients in units of TeV^{-2} . These results are obtained with a fit to LHC and LEP/SLC data for two parameterizations of the dependence of the observables on dimension-six operator coefficients. The first column lists the results from the fit based on the nominal parameterization, which includes terms proportional to Λ^{-2} and Λ^{-4} terms. The second column is obtained with a fit based on a parameterization that only includes Λ^{-2} terms. The coefficient $C_{t\varphi}$ is marginalized over in the fit, but discussed separately in section 6.

Figure 1. Corrected results of single-parameter individual fits to the Wilson coefficients of the dimension-six operators introduced in section 2. For each operator the 1σ uncertainty is shown. The three bars respectively correspond to the result of the combined fit using all data (red), to the constraint obtained from the most sensitive single measurement (light green), and to that of the second-best measurement (greyish green).

(a)

(b)

Figure 2. The 68% probability intervals (upper panel) and correlation matrix (lower panel) for the Wilson coefficients of the ten effective operators that modify the EW couplings of top and bottom quarks derived from a fit of the data included in table 1. The correlation matrix in `HEPfit` is calculated following ref. [9]. Detailed information about the correlation between the parameters and the complete covariance matrix of the fit are given in appendix C.1. Global (marginalized) limits obtained in the fit are shown as blue bars, the individual limits from single-parameter fit in red. The (local) minimum of the χ^2 are shown as triangles.

Figure 4. Figure 4 of the paper. Prospects for the precision of the Wilson coefficients in future high-luminosity operation of the LHC and at a high-energy e^+e^- collider. Assumptions on the operating scenarios and details of the uncertainty estimates are given in text. The solid section of the bars represents the individual constraints, where each parameter is fitted in isolation, the full length indicates the marginalized constraint in a ten-parameter fit. The complete covariance matrices of the fits that are presented in this figure are available in appendix C.2.

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