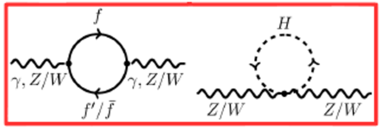
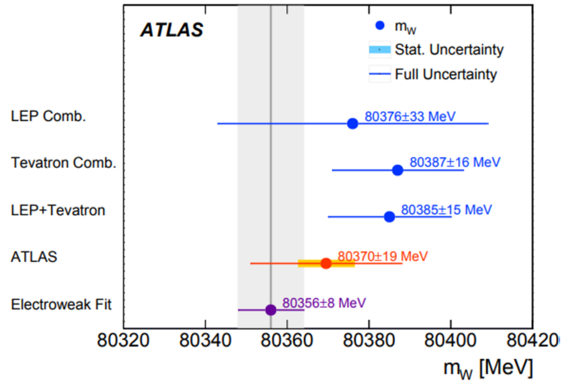
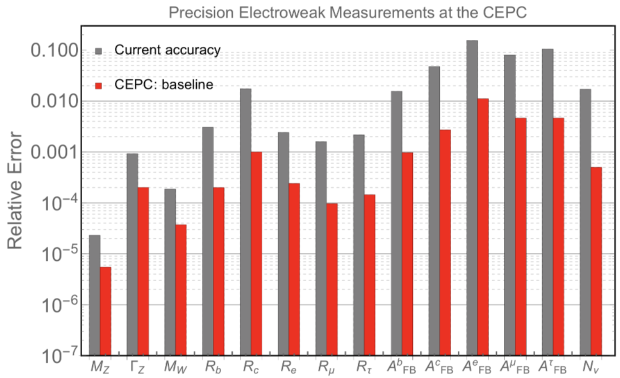
电弱和top夸克参数精确测量

α_{em}, G_F, M_Z, M_W, $\sin^2\theta_W$, m_{top}, M_H

$$m_W^2\left(1-\frac{m_W^2}{m_Z^2}\right)=\frac{\pi\alpha}{\sqrt{2}G_\mu}(1+\Delta r)$$







- LEP和Tevatron给出的W玻色子的质量的实验测量值比电弱拟合值要高出2倍的标准差； LHC和Tevatron的测量精度仍比电弱拟合结果精度高2倍。

- 弱混合角的实验测量上，美国SLAC实验的测量值比欧洲大型轻子对撞机上的测量值高3倍标准差。

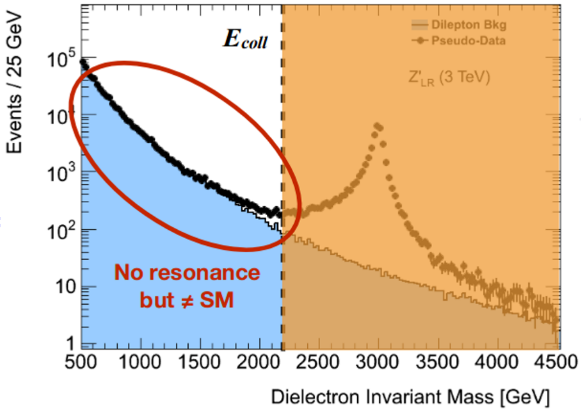
- top夸克质量误差目前为0.3GeV。真空稳定性的研究，对顶夸克质量的测量提出了更高的要求,。如果未来的测量显示真空处于亚稳定，则意味着高能标下的新物理。

- 亟需CEPC或Fcc-ee项目等更精确的实验来进一步精确测量弱混合角等关键的电弱物理观测量，以进一步验证标准模型电弱物理的自洽性，并有机会发现新物理的迹象。

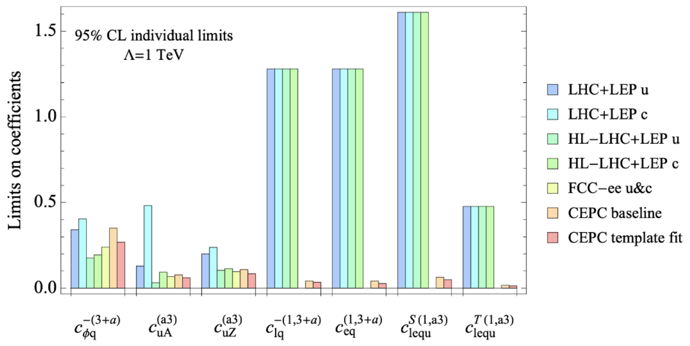
反常耦合、有效理论

$$\mathcal{L} = \mathcal{L}_{SM} + \frac{1}{\Lambda_{\delta L\neq 0}}\mathcal{L}_5 + \frac{1}{\Lambda^2_{\delta B=0}}\mathcal{L}_6 + \frac{1}{\Lambda^2_{\delta B\neq 0}}\mathcal{L}'_6 + \frac{1}{\Lambda^3_{\delta L\neq 0}}\mathcal{L}_7 + \frac{1}{\Lambda^4}\mathcal{L}_8 + \cdots$$

- 自下而上间接探测新物理
- 反常三、四规范玻色子耦合； Oblique参数
- 更全局性的框架，例如6维SMEFT:
  - LHC,CEPC,FCC都在进行EFT相关工作；
  - 电弱（精确观测量，TGC/QGC）、Top及Higgs等联合分析
  - 相关工作会是长期性、 跨对撞机的。



顶夸克FCNC和Global fit



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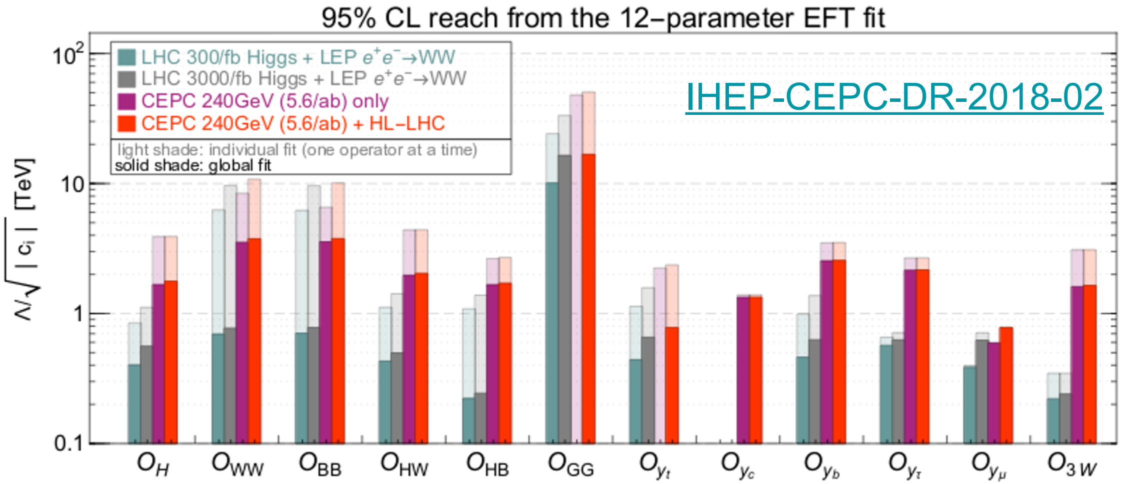

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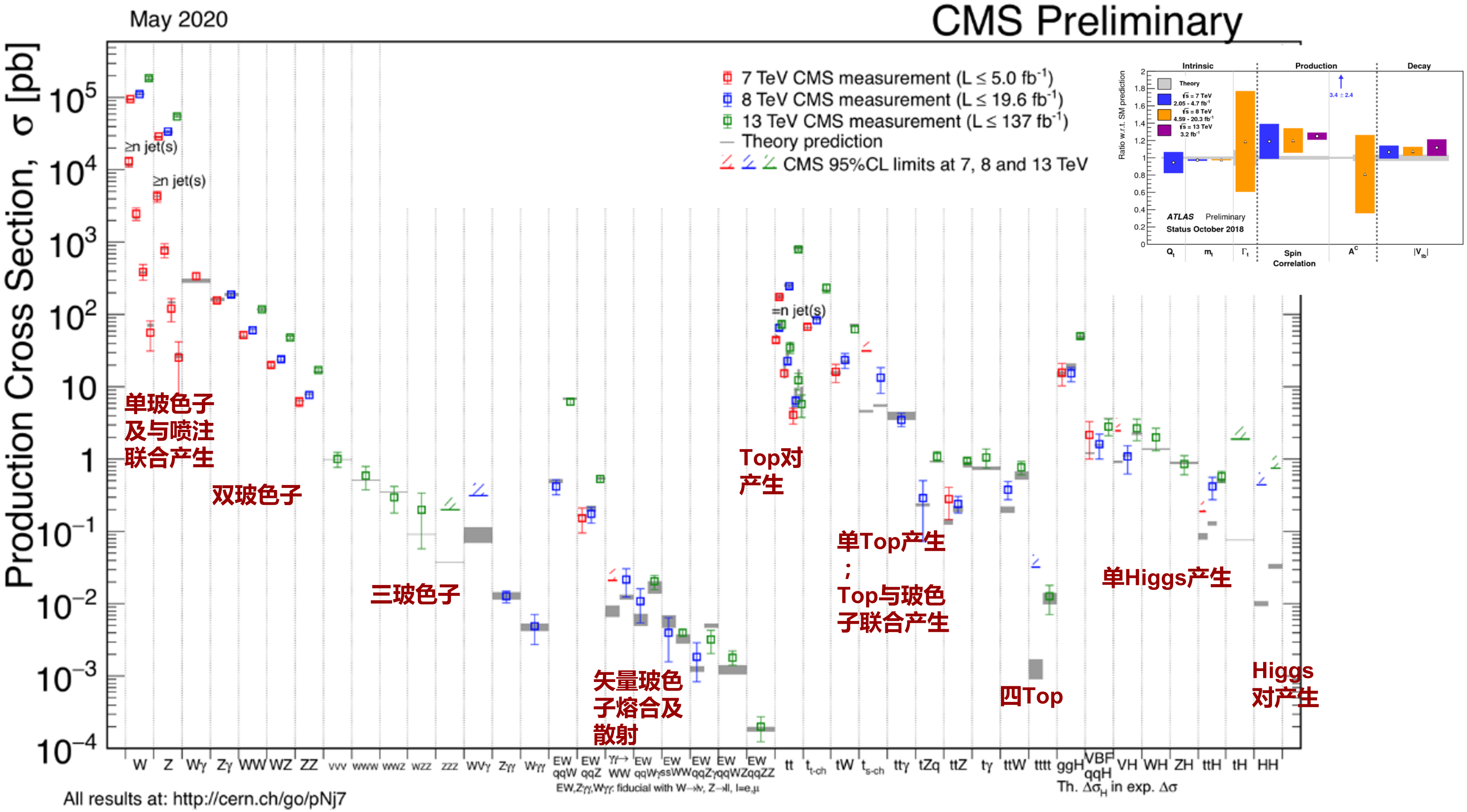
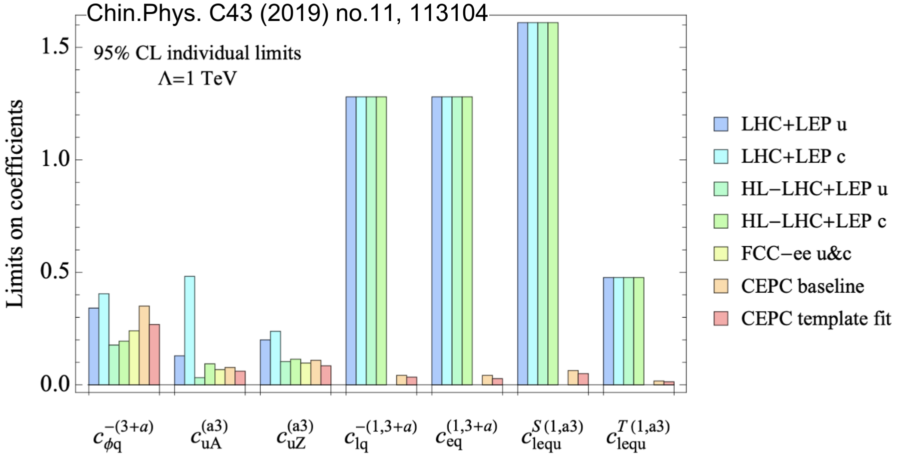
继续深入检验粒子物理标准模型：更广、更深、更细致

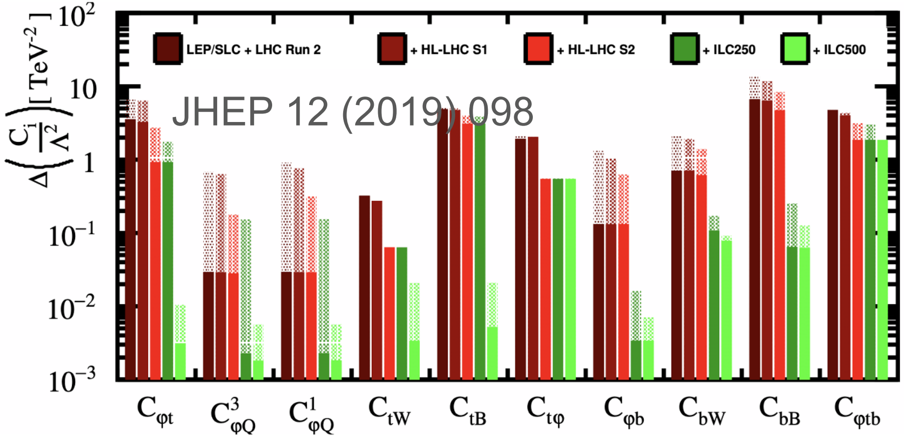
更小截面的稀有过程



backup

顶夸克FCNC和Global fit





$$O^1_{\varphi Q} \equiv \frac{y_t^2}{2}\quad \bar{q}\gamma^\mu q \quad \varphi^\dagger i\overleftrightarrow{D}_\mu\varphi,$$

$$O^3_{\varphi Q} \equiv \frac{y_t^2}{2}\quad \bar{q}\tau^I\gamma^\mu q \quad \varphi^\dagger i\overleftrightarrow{D}^I_\mu\varphi,$$

$$O_{\varphi u} \equiv \frac{y_t^2}{2}\quad \bar{u}\gamma^\mu u \quad \varphi^\dagger i\overleftrightarrow{D}_\mu\varphi,$$

$$O_{\varphi d} \equiv \frac{y_t^2}{2}\quad \bar{d}\gamma^\mu d \quad \varphi^\dagger i\overleftrightarrow{D}_\mu\varphi,$$

$$O_{\varphi ud} \equiv \frac{y_t^2}{2}\quad \bar{u}\gamma^\mu d \quad \varphi^T \epsilon i D_\mu\varphi,$$

$$O_{uW} \equiv y_t g_W \quad \bar{q}\tau^I\sigma^{\mu\nu}u \quad \epsilon\varphi^* W^I_{\mu\nu},$$

$$O_{dW} \equiv y_t g_W \quad \bar{q}\tau^I\sigma^{\mu\nu}d \quad \epsilon\varphi^* W^I_{\mu\nu},$$

$$O_{uB} \equiv y_t g_Y \quad \bar{q}\sigma^{\mu\nu}u \quad \epsilon\varphi^* B_{\mu\nu},$$

$$O_{dB} \equiv y_t g_Y \quad \bar{q}\sigma^{\mu\nu}d \quad \epsilon\varphi^* B_{\mu\nu},$$

$$O_{u\varphi} \equiv \bar{q}u \quad \epsilon\varphi^* \quad \varphi^\dagger\varphi,$$

$$O_{d\varphi} \equiv \bar{q}d \quad \epsilon\varphi^* \quad \varphi^\dagger\varphi,$$