FCC Jamboree:
Constraining BSM theories with oblique parameters, FCC improvements

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IP2I Lyon

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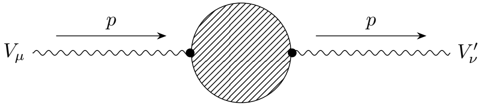

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Oblique parameters

A generic way to constrain a BSM theory and sensitive to high energy new physics

Oblique parameters: Loop corrections

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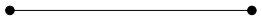

tree level

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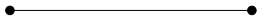

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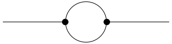

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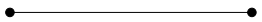

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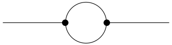

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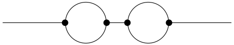

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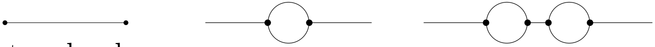

tree level — 1-loop — 2-loop

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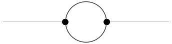

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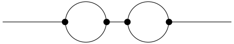

2-loop

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- Corrections to EW observables are described by 3 measurable quantities S,T and U also called Peskin-Takeuchi parameters or oblique parameters.

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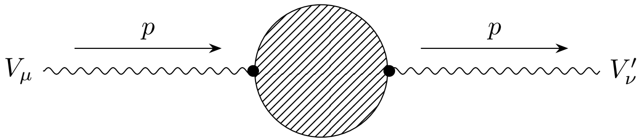
- Through vacuum polarisation functions, observables associated to EW vector bosons $(m, \Gamma, s_\theta, G_F, \alpha)$ undergo a correction due to the addition of new particles



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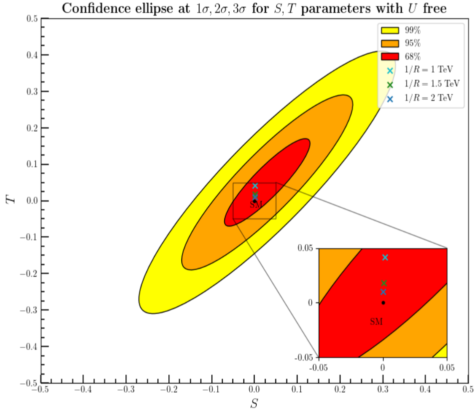
Need more precise values!

FCC prediction → Divide the uncertainty by roughly 10!

Fits example for U free



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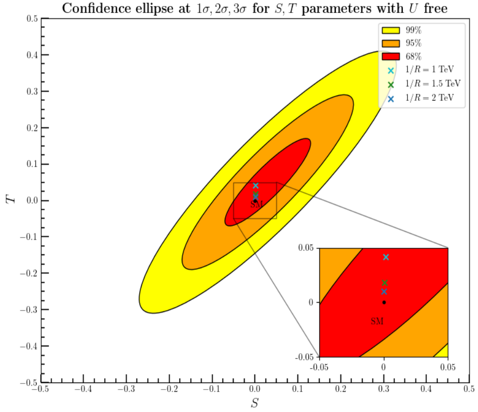

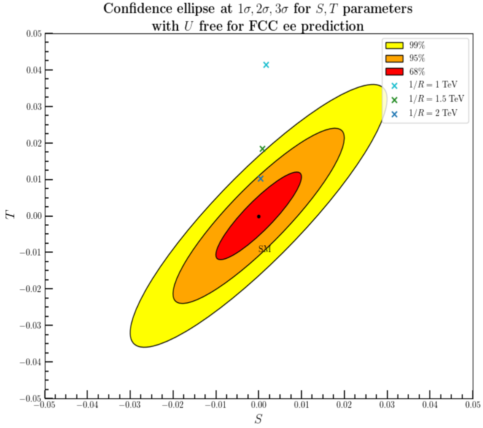

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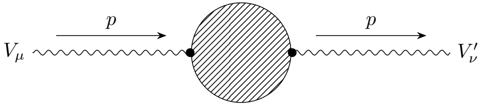
Thank you!

Oblique parameters: S,T U formalism

- All new interactions in the propagator can be schematized as:



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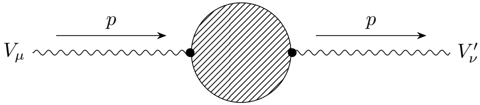

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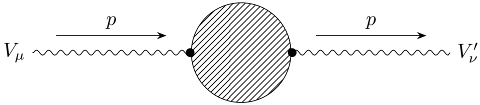

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$$S = \frac{4s_w^2c_w^2}{\alpha_e}\left[\frac{\Pi_{ZZ}\left(m_Z^2\right) - \Pi_{ZZ}\left(0\right)}{m_Z^2} - \frac{c_w^2 - s_w^2}{c_w s_w}\frac{\Pi\left(m_Z^2\right)}{m_Z^2} - \frac{\Pi_{\gamma\gamma}\left(m_Z^2\right)}{m_Z^2}\right]$$

$$T = \frac{1}{\alpha_e}\left[\frac{\Pi_{WW}\left(0\right)}{m_W^2} - \frac{\Pi_{ZZ}\left(0\right)}{m_Z^2}\right]$$

$$U = \frac{4s_w^2}{\alpha_e}\left[\frac{\Pi_{WW}\left(m_W^2\right) - \Pi_{WW}\left(0\right)}{m_W^2} - \frac{c_w}{s_w}\frac{\Pi_{Z\gamma}\left(m_Z^2\right)}{m_Z^2} - \frac{\Pi_{\gamma\gamma}\left(m_Z^2\right)}{m_Z^2}\right] - S$$

Fits example for U=0