The Strange Quark as a probe for new Physics in the Higgs Sector

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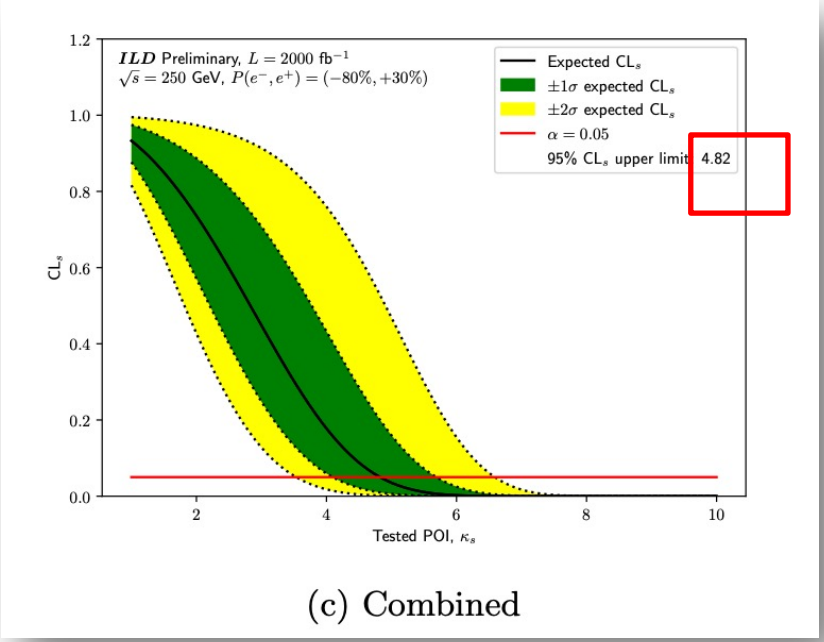
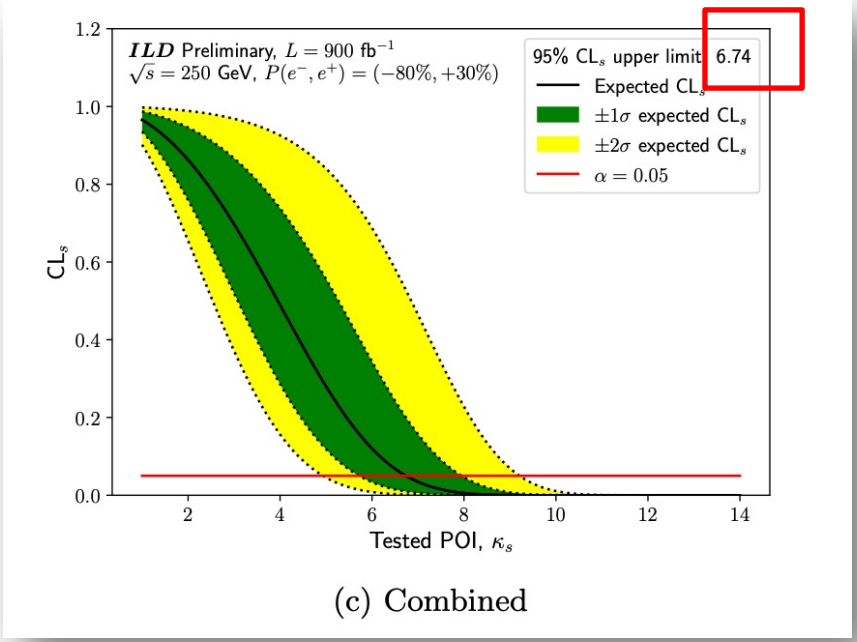
News

- All comments received by ILD review have been addressed
  - The most challenging one on the polarization has been temporarily fixed
    - The new samples have also been requested, to be looked at after 15/03
  - You can see both versions of the paper here: https://agenda.linearcollider.org/event/9619/#62-strange-quark-as-a-probe-fo

OLD



NEW



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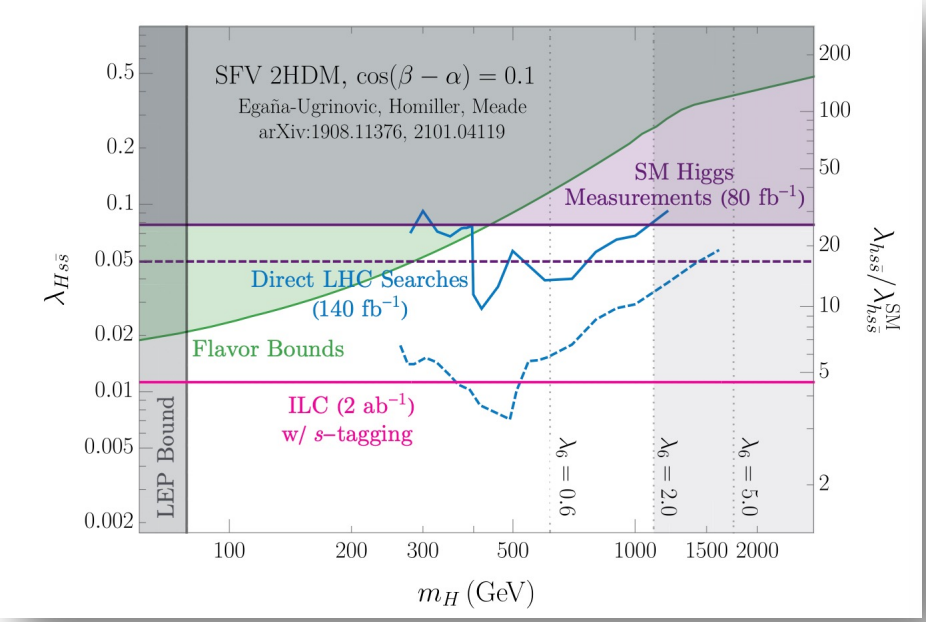

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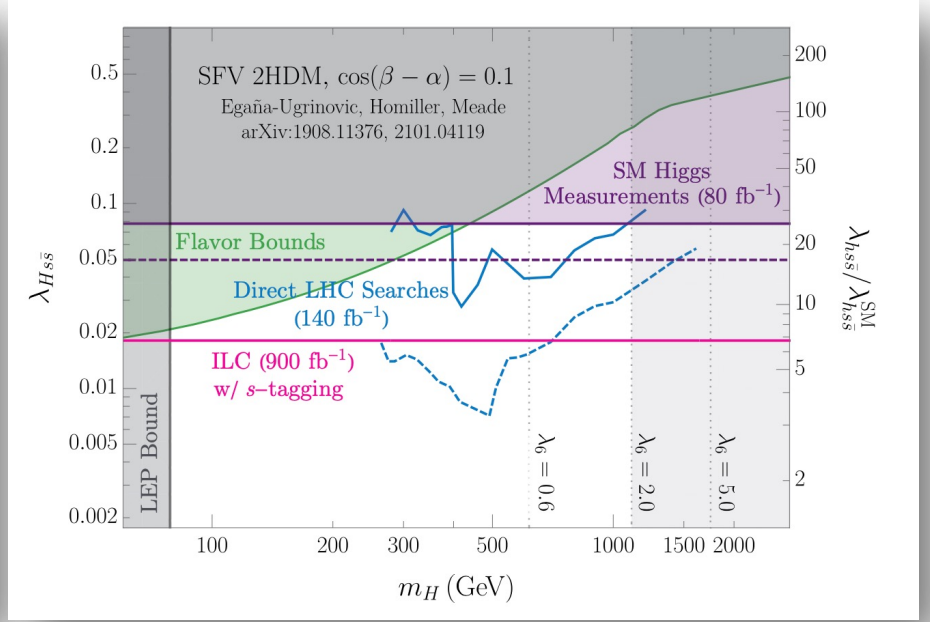

Other Snowmass papers of Interest

- ILC white paper: https://agenda.linearcollider.org/event/9135/
  - It includes a nice summery of our work, both on the analysis side and on the RICH studies
  - From. M. Peskin: *Reference Version #2, with the author list. Please check your entry and let me know if it needs changes. I have tried hard, but with 440 authors there are sure to be errors. If you registered too late to be on this list, let me know and I will add your name.*

- C^3 white paper: https://www.overleaf.com/read/mzgfcgwhzjzz
  - If you are interested in signing it, get in touch with Caterina!

Thanks for your attention!

Valentina Cairo

Reviewer's comments

OLD

All MC samples are generated using 100% left-handed- (LH-) polarised electron beams and 100% right-handed- (RH-) polarised positron beams. As we consider the ILC running scenario at $\sqrt{s} = 250\,\text{GeV}$ using 80% LH-polarised electron beams (i.e., $P_L[e^-] = -80\%$) and 30% RH-polarised positron beams (i.e., $P_R[e^+] = +30\%$), the polarisation-inclusive cross section σ_{inc} must be corrected. In particular, the 100% LH electron and 100% RH positron cross section σ_{LR} is given by:

$$\begin{aligned}\sigma_{LR} &= P_L P_R \sigma_{\text{inc}} \\ &= \frac{1 - P_L[e^-]}{2}\frac{1 + P_R[e^+]}{2}\sigma_{\text{inc}} \\ &= 0.585\sigma_{\text{inc}}\,.\end{aligned} \tag{1}$$

For this particular running scenario, an integrated luminosity $\mathcal{L}$ of $2\,\text{ab}^{-1}$ is expected, as per the ILC physics programme [53]. Using the corrected cross sections and the expected luminosity, each sample is normalised prior to applying any analysis cuts, where the event weights are modified as:

$$w_i' = \frac{\mathcal{L}\sigma_{LR}}{\sum_j w_j} w_i \,\forall\, i\,, \tag{2}$$

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All MC samples are generated using 100% left-handed- (LH-) polarised electron beams and 100% right-handed-(RH-) polarised positron beams. We consider the ILC running scenario at $\sqrt{s} = 250\,\text{GeV}$ using 80% LH-polarised electron beams (i.e., $P_{e^-} = -80\%$) and 30% RH-polarised positron beams (i.e., $P_{e^+} = +30\%$), abbreviated as $P(e^-, e^+) = (-80\%, +30\%)$. The total cross section $\sigma_{P(e^-,e^+)}$ for an arbitrary polarisation scenario is given by:

$$\sigma_{P(e^-,e^+)} = \frac{1-P_{e^-}}{2}\frac{1+P_{e^+}}{2}\sigma_{LR} + \frac{1+P_{e^-}}{2}\frac{1-P_{e^+}}{2}\sigma_{RL} + \frac{1-P_{e^-}}{2}\frac{1-P_{e^+}}{2}\sigma_{LL} + \frac{1+P_{e^-}}{2}\frac{1+P_{e^+}}{2}\sigma_{RR}\,, \tag{1}$$

For $\sqrt{s} = 250\,\text{GeV}$ running scenario, an integrated luminosity $\mathcal{L}$ of $2000\,\text{fb}^{-1}$ is expected, as per the ILC physics programme [56] and ILC Snowmass white paper [57]. According to the white paper, which is the most up-to-date source on the proposed physics programme, only 45% of the $2000\,\text{fb}^{-1}$ is expected to be operated in $P(e^-, e^+) = (-80\%, +30\%)$ polarisation scenario. Our expected luminosity $\mathcal{L}$ is therefore $900\,\text{fb}^{-1}$.

Using the LR cross sections and the expected luminosity, each sample is normalised prior to applying any analysis cuts, where the event weights are modified as:

$$w_i' = 0.585 \times \frac{\mathcal{L}\sigma_{LR}}{\sum_j w_j} w_i \,\forall\, i\,, \tag{2}$$

where w_i is the weight for event i and $\mathcal{L} = 900\,\text{fb}^{-1}$. N.B. there is no estimate available for the SM