Update on Powheg ew

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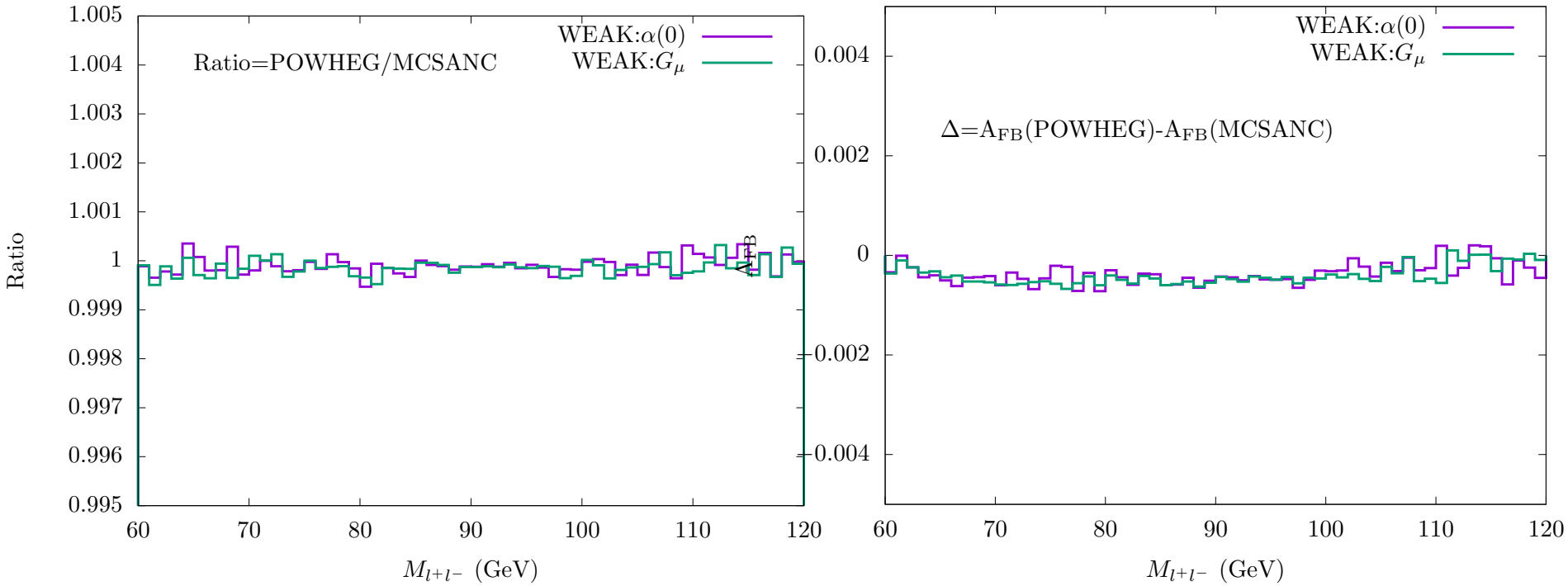
thanks to fruitful collaboration with Lida Kalinoswkaya and Serge Bondarenko

Status of comparisons with MCSANC as of 2018

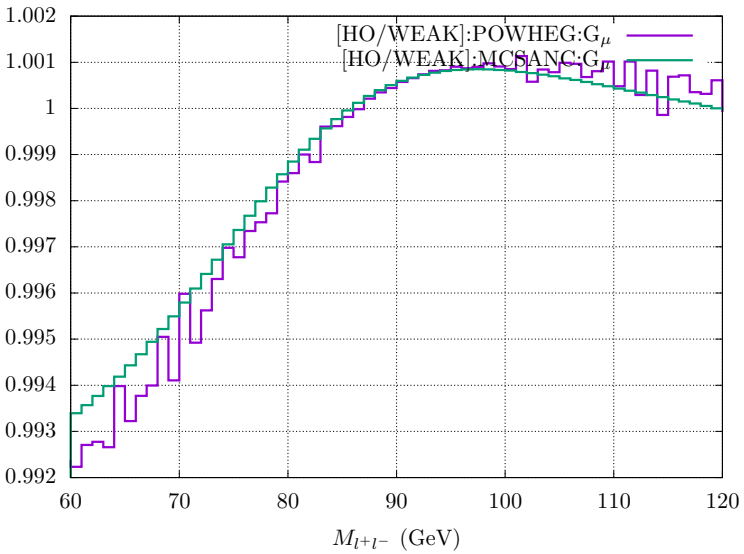
- G_μ, M_W, M_Z scheme
- no cuts on leptons except for $M_{\ell\ell} \geq 50$ GeV

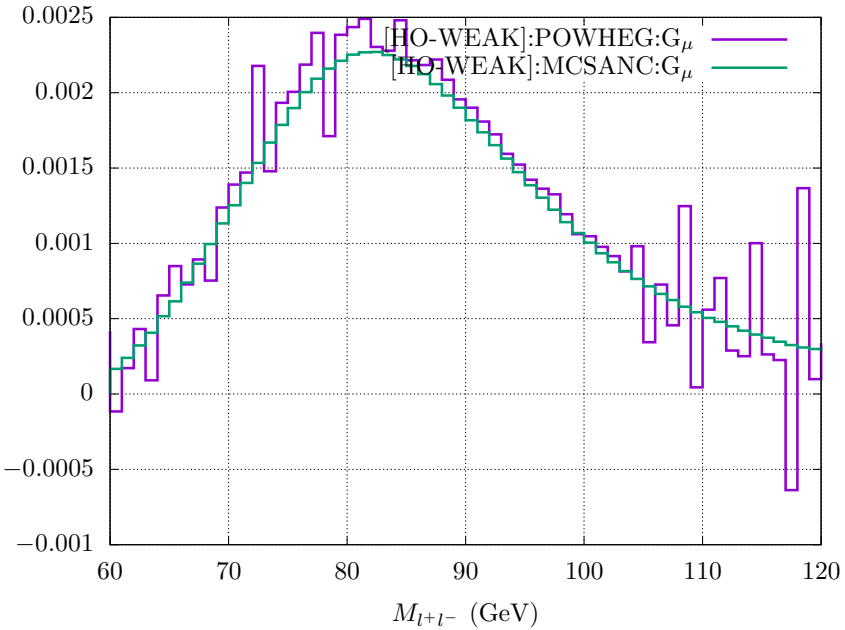


plots by S. Bondarenko

- large discrepancies in HO found in the last round of comparisons

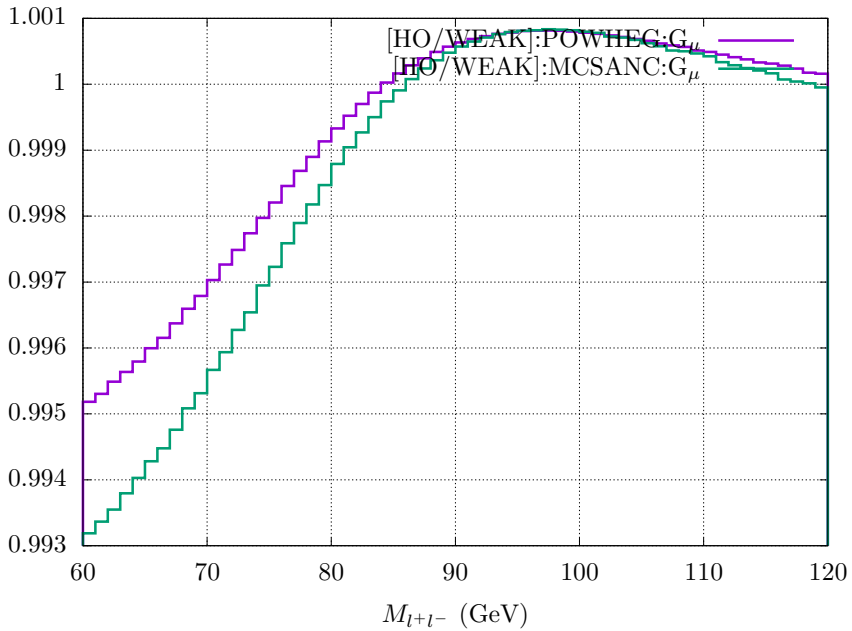
comparisons with 2018 data

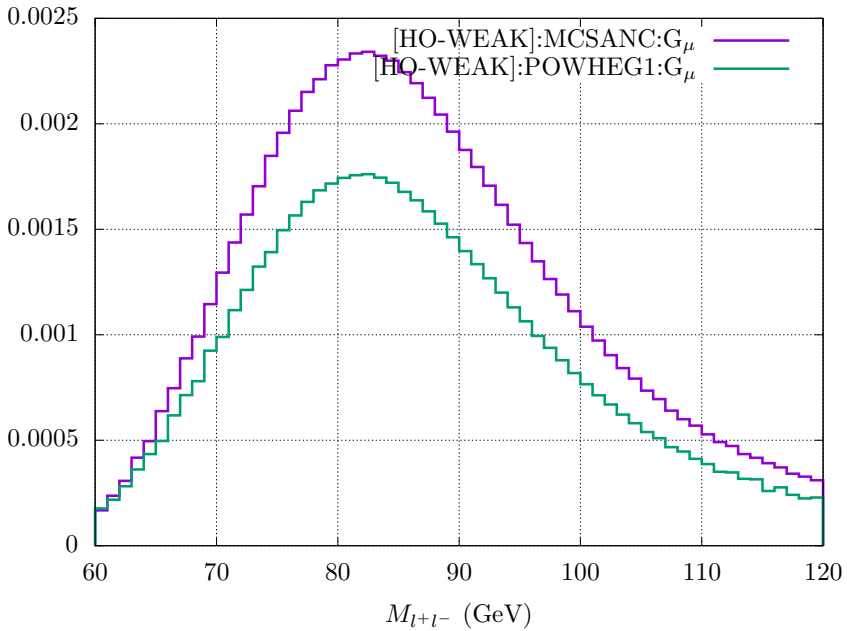




plots by S. Bondarenko

latest comparisons





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NLO within POWHEG_ew

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- for QED corrections the real photon radiation requires that the correction factor is proportional to α
- in order to cancel IR divergences between real and virtual corrections, also the virtual corrections need the explicit factor $\alpha(0)$
- the up to $\mathcal{O}(\alpha)$ contribution is $\mathcal{O}(\alpha_{G_\mu}\alpha)$

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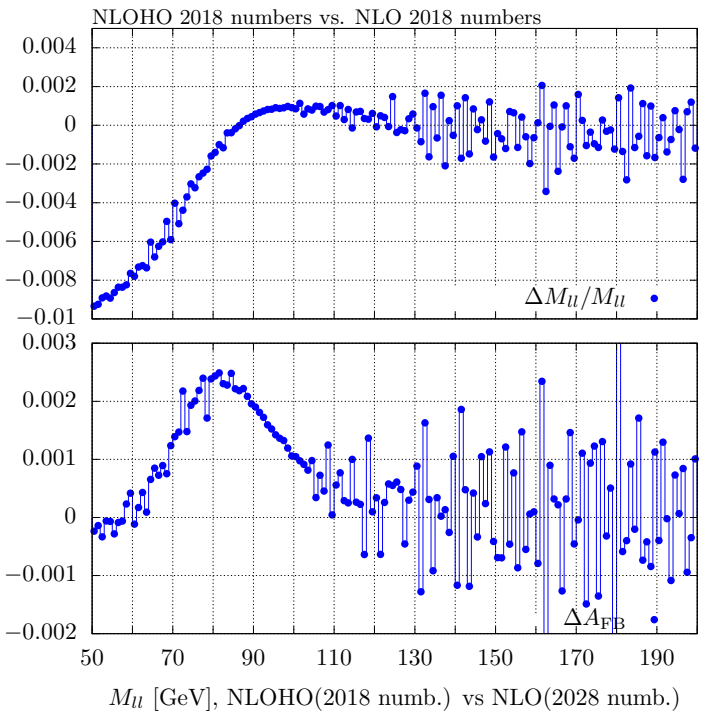
$$\Delta\rho = \frac{3\sqrt{2}}{16\pi^2} G_\mu m_t^2$$

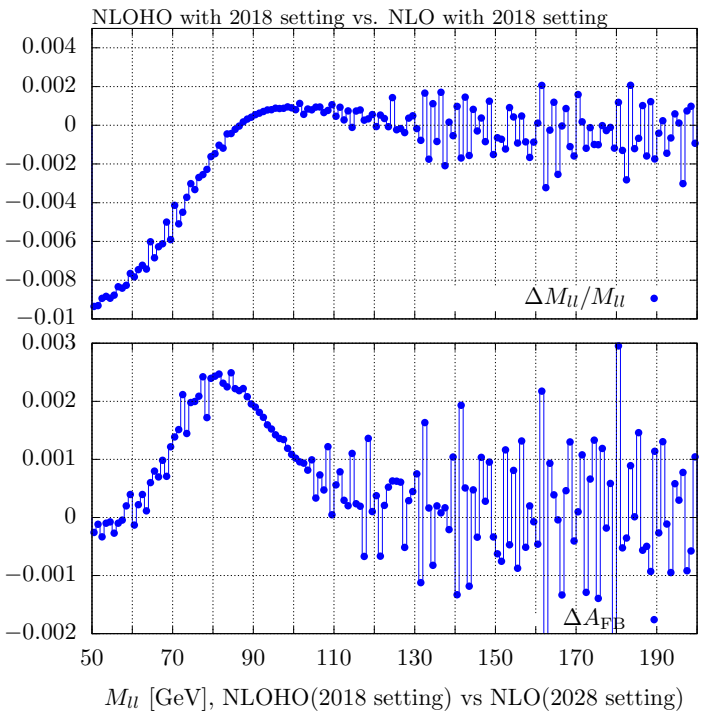
- realized with debugging last year $\Longrightarrow$ for the one-loop subtraction

$$\Delta\rho = \frac{\alpha}{16\pi} \frac{3m_t^2}{\left(1 - M_W^2/M_Z^2\right) M_W^2}$$

higher orders with 2018 input setting

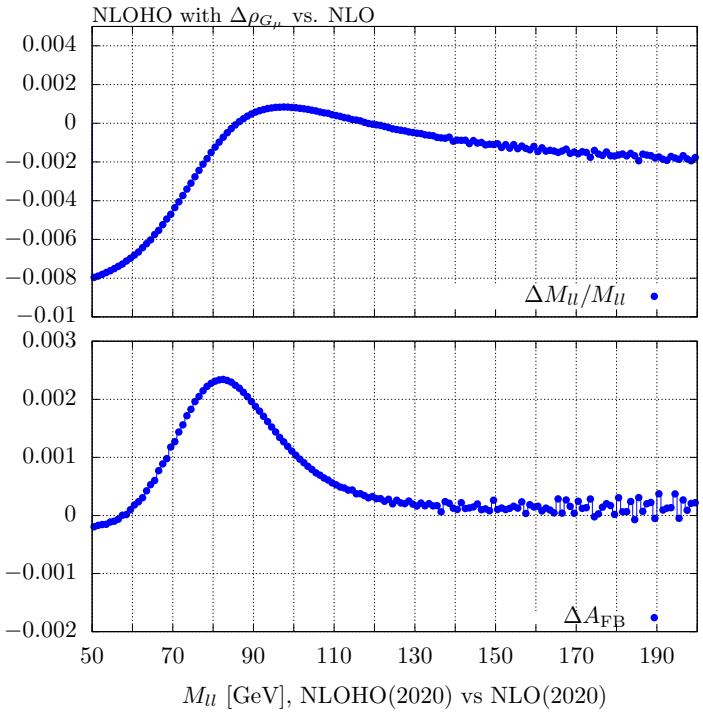
- Left: with numbers produced with the old code
- Right: numbers with the new code with 2018 setting and stat

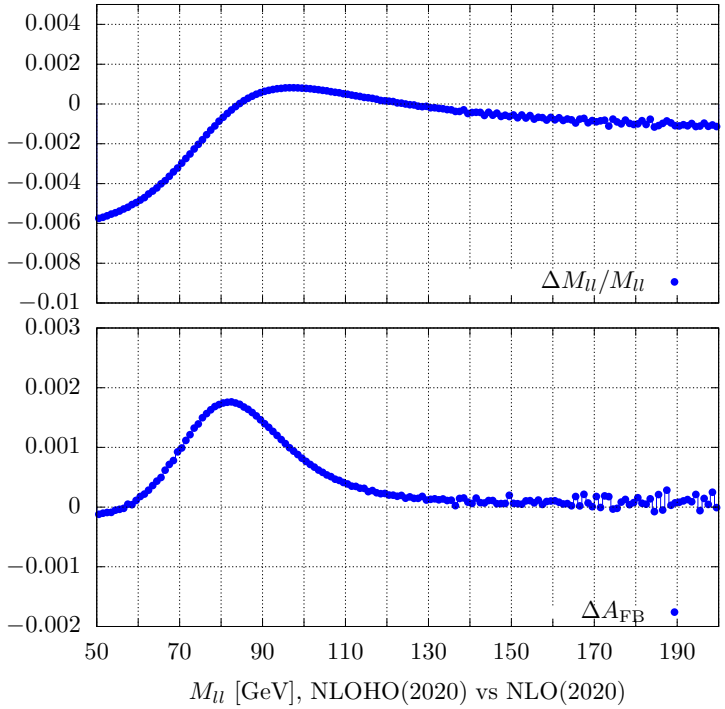




higher orders with present input setting

- Left: with subraction of $\Delta\rho_1$ expressed with G_μ
- Right: with subraction of $\Delta\rho_1$ expressed with α

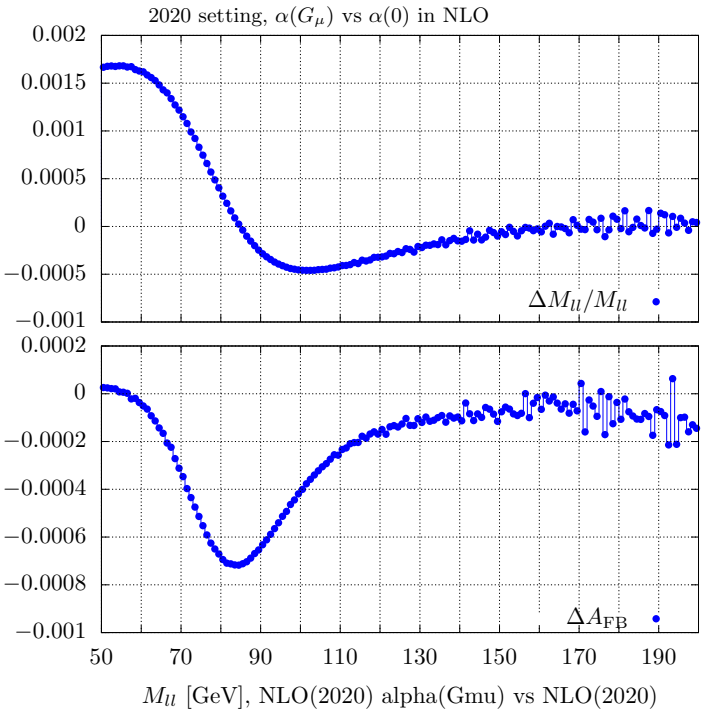




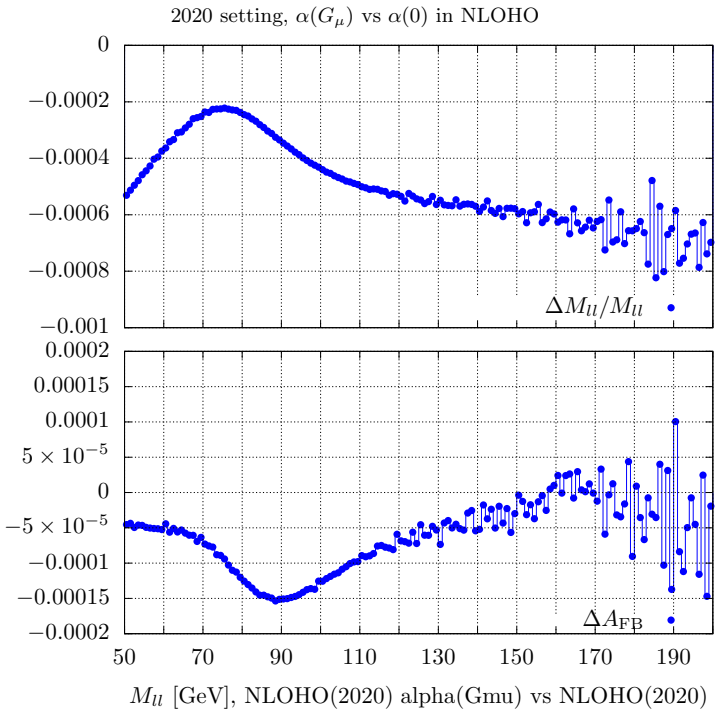
- with the split of QED and EW corrections, we can calculate the EW corrections with α_{G_μ} ($\Delta\rho_1$ subtraction performed with G_μ)

as in S. Dittmaier and M. Huber, JHEP01 (2010) 060

- Left: NLO; Right: NLOHO



PRELIMINARY



PRELIMINARY

Summary

- we reproduce the "old" numbers setting the $\Delta\rho_1$ subtraction in NLO calculation as in the original version, i.e. $\Delta\rho_1$ calculated with G_μ
- however this is not consistent
- the calculation of weak corrections based on α_{G_μ} or α could be considered as a source of th. uncertainty, to be taken into account
- numbers with the full Complex Mass Scheme are being processed