

Update from MCSANC

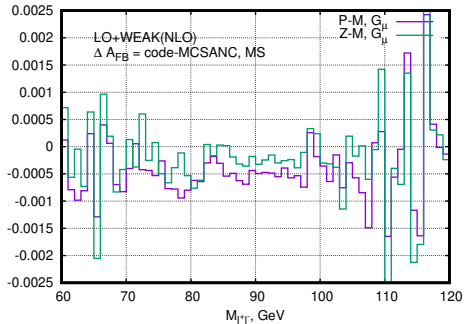
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ΔA_{FB} [LO+WEAK(NLO)]: Powheg_ew, WZGRAD2 and MCSANC

P = Powheg_ew, Z = WZGRAD2, M = MCSANC



@ Z pick:

Powheg_ew - MCSANC $\sim 5 \cdot 10^{-4}$

WZGRAD2 - MCSANC $\sim 3 \cdot 10^{-4}$

Factorization scheme (FS):

$$\sigma^{NLO}(\Gamma_Z) \sim \delta^{NLO}(\Gamma_Z = 0) \times \sigma^{LO}(\Gamma_Z) = \frac{\sigma^{NLO}(\Gamma_Z = 0)}{\sigma^{LO}(\Gamma_Z = 0)} \times \sigma^{LO}(\Gamma_Z)$$

Γ_Z is the Z-boson width (NLO)

MCSANC scheme (MS):

$$\sigma^{NLO}(\Gamma_Z) \sim \sum_{spins} |\mathcal{H}|^2$$

$$\mathcal{H} \sim \alpha \chi_Z(\Gamma_Z) [1 + \alpha \text{FF}]$$

$$|\mathcal{H}|^2 \sim \alpha^2 \chi_Z(\Gamma_Z)^2 [1 + 2\alpha \text{FF} + \mathcal{O}(\alpha^2)]$$

the complex-valued functions:

$\chi_Z(\Gamma_Z) \sim \frac{1}{s - M_Z^2 + iM_Z\Gamma_Z}$ is the Z-boson propagator,

$\text{FF} = \text{Re}(\text{FF}) + i\text{Im}(\text{FF})$ is the one-loop form factor

In MS there is an additional term proportional to Γ_Z :

$$\Gamma_Z \text{Im}(\text{FF})$$

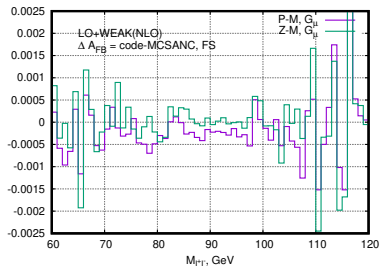
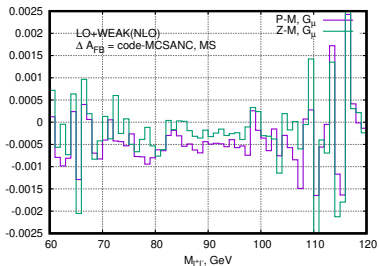
To have the FS, one needs to drop $\text{Im}(\text{FF}) = 0$.

$A_{\text{FB}}[\text{LO}+\text{NLO}]-A_{\text{FB}}[\text{LO}]$ difference

GeV	89-93	60-81	81-101	101-150
$\alpha(0)$ -scheme				
MCSANC(MS)	-0.01596(1)	-0.01103(6)	-0.01595(1)	-0.00628(8)
MCSANC(FS)	-0.01618(1)	-0.01118(7)	-0.01618(1)	-0.00647(7)
POWHEG_ew	-0.01641(2)	-0.01148(3)	-0.01640(2)	
WZGRAD2	-0.01619(2)	-0.01121(12)	-0.01617(2)	-0.00650(14)
RADY(FS)	-0.01620(1)	-0.01133(1)	-0.01619(1)	-0.00642(1)
G_μ -scheme				
MCSANC(MS)	-0.01688(2)	-0.01170(8)	-0.01688(2)	-0.00669(7)
MCSANC(FS)	-0.01717(2)	-0.01183(8)	-0.01715(2)	-0.00688(7)
POWHEG_ew	-0.01740(2)	-0.01214(3)	-0.01738(2)	
WZGRAD2	-0.01716(2)	-0.01186(11)	-0.01715(2)	-0.00686(14)
RADY(FS)	-0.01717(1)	-0.01199(1)	-0.01716(1)	-0.00681(1)

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WZGRAD2 - MCSANC ~ 0