

# MCSANC for QED(ISR,IFI) $pp \rightarrow \mu^+ \mu^-$ @ 8 TeV

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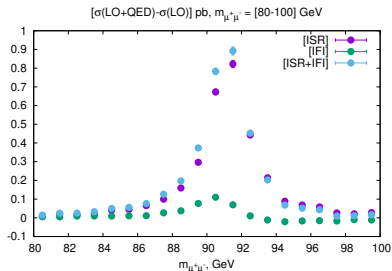
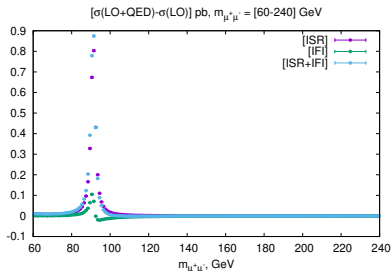
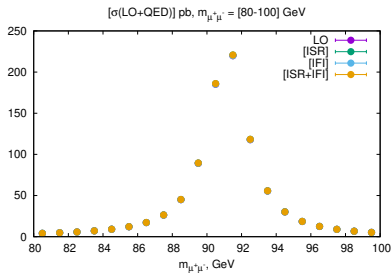
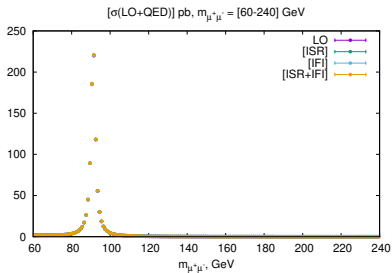
**SETUP:**

- LO QCD – no QCD corrections
- Only Initial-State-Radiation (ISR) and Initial-Final-Interference (IFI) QED effects – no WEAK and Final-State-Radiation (FSR) effects
- MSTW2008nlo68cl PDF-function
- $G_\mu$  EW-scheme: Born  $\sim \alpha^2(G_\mu)$ , Virtual, Soft-, Hard-Brem  $\sim \alpha_0 \alpha^2(G_\mu)$   
( $\alpha_0=1/137.0360, \alpha(G_\mu)=1/132.2332$ )
- Fixed-width scheme:  $\text{prop}(s, M_Z) = 1/(s - [M_Z^2 - iM_Z w_Z])$

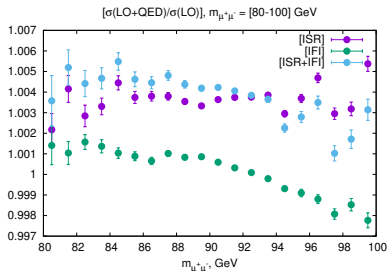
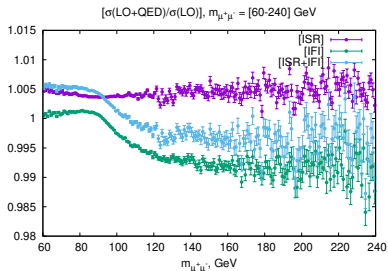
**Integrated cross-section  $\sigma$  (pb) and  $\delta = \sigma(QED)/\sigma(LO)$  (%)  
distribution on  $m_{\mu^+\mu^-}$**

$m_{\mu^+\mu^-}$ , GeV	60-240	80-100
$\sigma(LO)$	961.713(3)	880.60(1)
$\sigma(QED_{ISR})$	3.572(5)	3.23(4)
$\sigma(QED_{IFI})$	0.114(4)	0.29(4)
$\sigma(QED_{ISR+IFI})$	3.686(6)	3.52(5)
$\delta(QED_{ISR})$	0.371(1)	0.367(1)
$\delta(QED_{IFI})$	0.0119(1)	0.033(1)
$\delta(QED_{ISR+IFI})$	0.383(1)	0.400(1)

## Cross-section distribution on $m_{\mu^+ \mu^-}$



## Ratios distribution on $m_{\mu^+ \mu^-}$

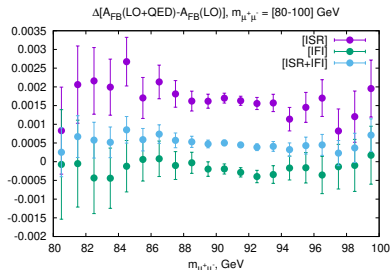
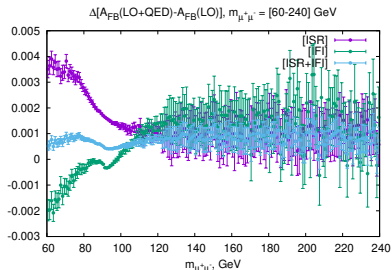
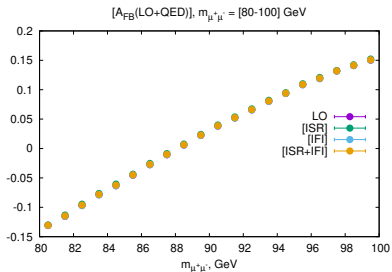
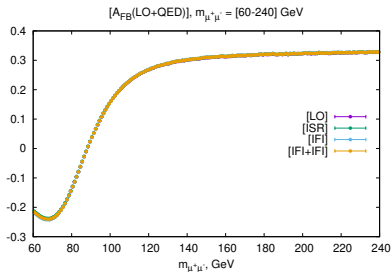


PRELIMINARY

**Integrated  $A_{\text{FB}}(\text{LO})$  and  $\Delta[A_{\text{FB}}(\text{LO}+\text{QED})-A_{\text{FB}}(\text{LO})]$   
distribution on  $m_{\mu^+\mu^-}$**

$m_{\mu^+\mu^-}$ , GeV	60-240	89-93	80-100	70-120
$A_{\text{FB}}(\text{LO})$	0.039333	0.046197	0.043300	0.042009
$\Delta A_{\text{FB}}(\text{QED}_{\text{ISR}})$	0.000861	0.000833	0.000843	0.000851
$\Delta A_{\text{FB}}(\text{QED}_{\text{IFI}})$	-0.000120	-0.000128	-0.000113	-0.000109
$\Delta A_{\text{FB}}(\text{QED}_{\text{ISR}+\text{IFI}})$	0.000494	0.000470	0.000486	0.000494

## $A_{FB}(LO)$ and $\Delta[A_{FB}(LO+QED)-A_{FB}(LO)]$ distribution on $m_{\mu^+ \mu^-}$



## SUMMARY:

- QCD effects to be account
- Integrated ISR gives 0.36-0.37 %, IFI – 0.01-0.03 %, and sum – 0.38-0.40 % contribution to the cross-section near the Z-boson resonance
- $\Delta[A_{\text{FB}}(\text{LO}+\text{QED}(\text{ISR}+\text{IFI}))-A_{\text{FB}}(\text{LO})]$  is rather flat near the Z-boson resonance
- Fixed-width vs. running-width scheme to be investigated