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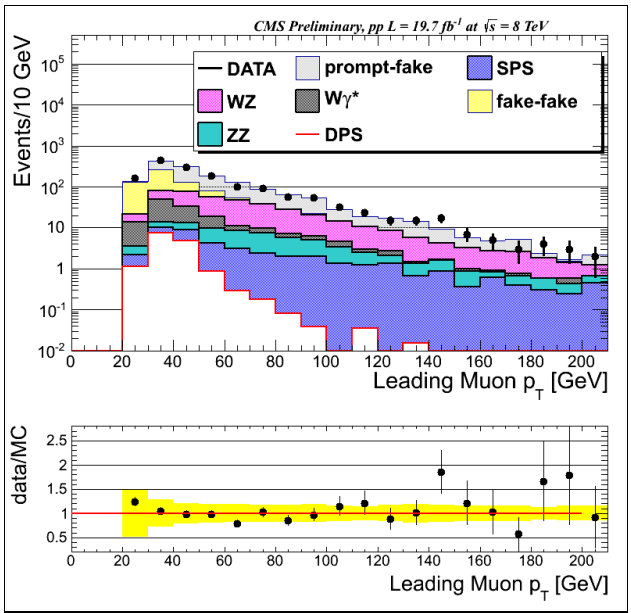
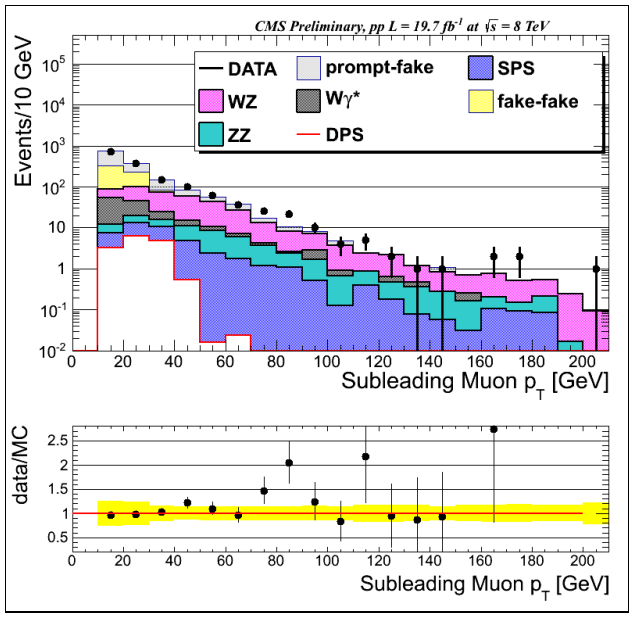
Double Parton Scattering cross section limit from same-sign W bosons pair production in di-muon final state at LHC

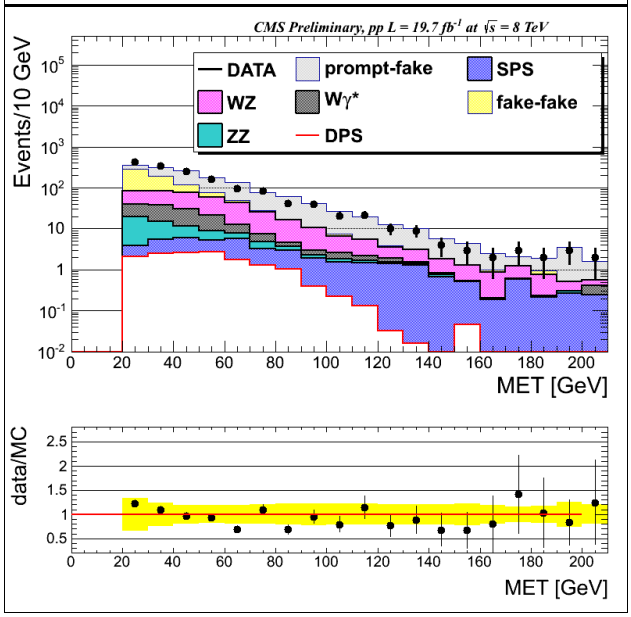
Abstract

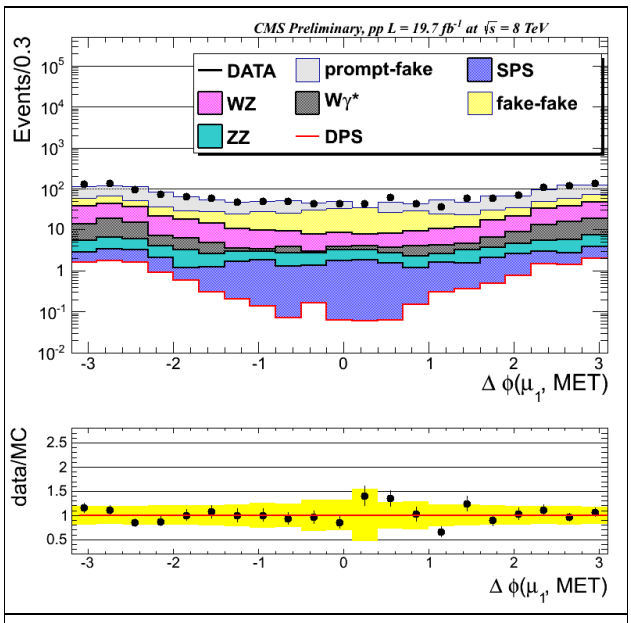
The double parton scattering (DPS) in proton-proton collisions at a center-of-mass energy of 8 TeV has been investigated using the same-sign W boson pair final state, with each W boson decaying into muon and associated neutrino. The data sample corresponds to an integrated luminosity of $19.7~\unit{fb}^{-1}$ collected by the CMS detector at the Large Hadron Collider. The observables sensitive to double parton scattering are defined and studied, followed by a multivariate analysis in order to enhance the process sensitivity. A limit on the DPS yield, along with the corresponding limit on the production cross section (σ^{DPS}_{WW}), has been evaluated.

Figures





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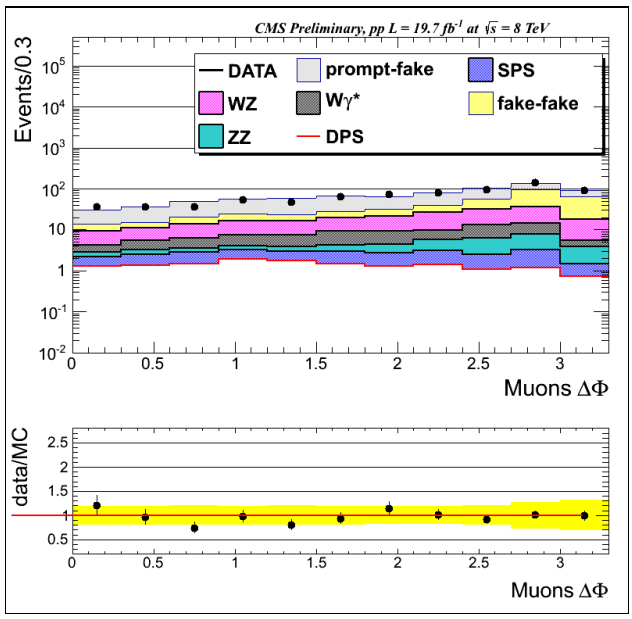
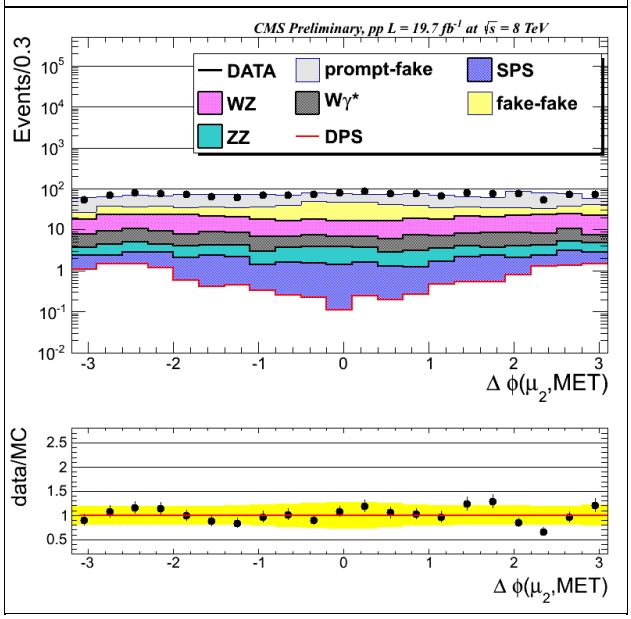
DATA
prompt-fake
SPS
WZ
Wγ*
fake-fake
ZZ
DPS
Events/0.3
Δ φ(μ1, MET)
data/MC
Δ φ(μ1, MET)


CMS Preliminary, pp L = 19.7 fb-1 at √s = 8 TeV
DATA
prompt-fake
SPS
WZ
Wγ*
fake-fake
ZZ
DPS
Events/0.3
Muons ΔΦ
data/MC
Muons ΔΦ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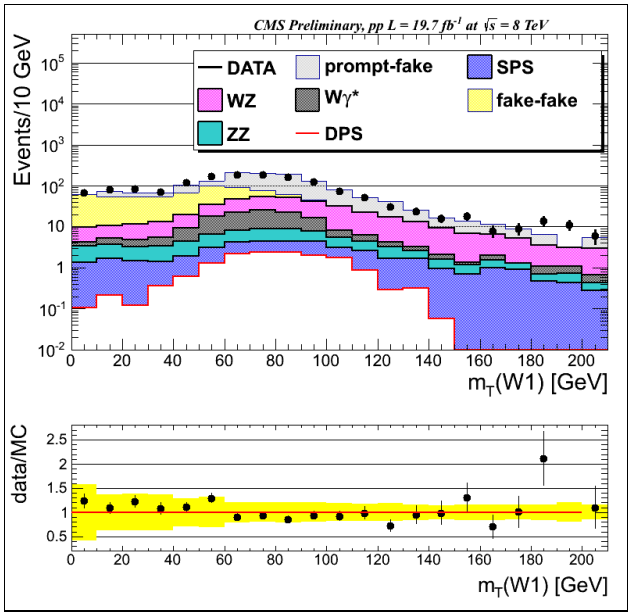
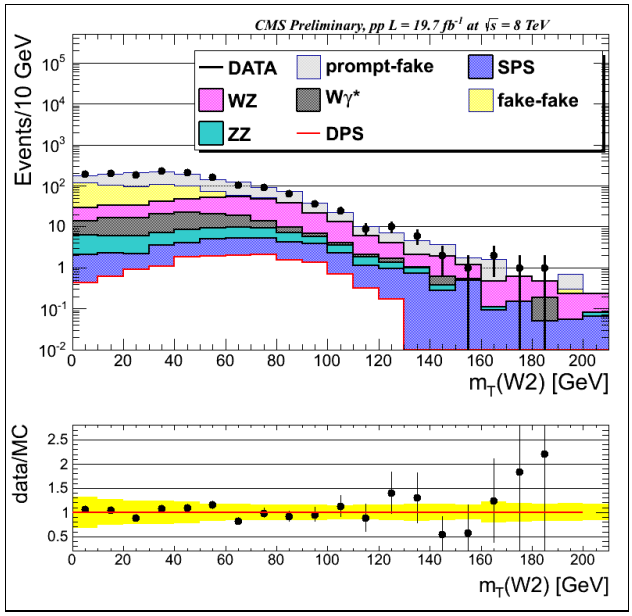
DATA
prompt-fake
SPS
WZ
Wγ*
fake-fake
ZZ
DPS
Events/0.3
Δ φ(μ2,MET)
data/MC
Δ φ(μ2,MET)


CMS Preliminary, pp L = 19.7 fb-1 at √s = 8 TeV
DATA
prompt-fake
SPS
WZ
Wγ*
fake-fake
ZZ
DPS
Events/10 GeV
mT(W1) [GeV]
data/MC
mT(W1) [GeV]


CMS Preliminary, pp L = 19.7 fb-1 at √s = 8 TeV
DATA
prompt-fake
SPS
WZ
Wγ*
fake-fake
ZZ
DPS
Events/10 GeV
mT(W2) [GeV]
data/MC
mT(W2) [GeV]

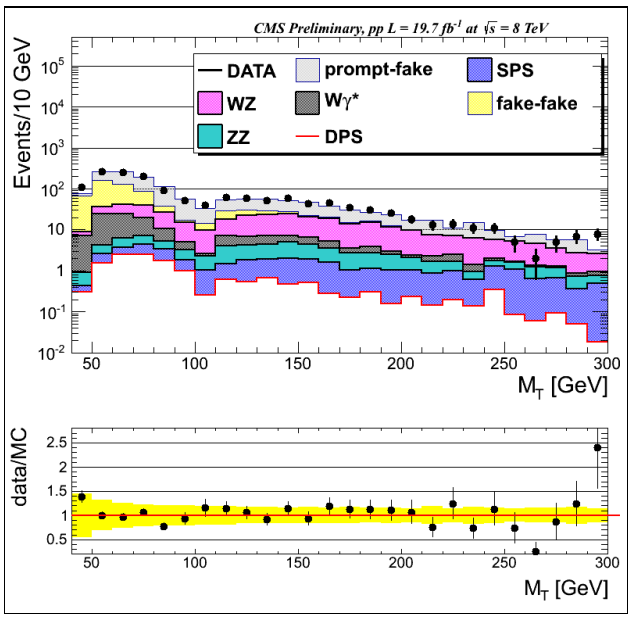
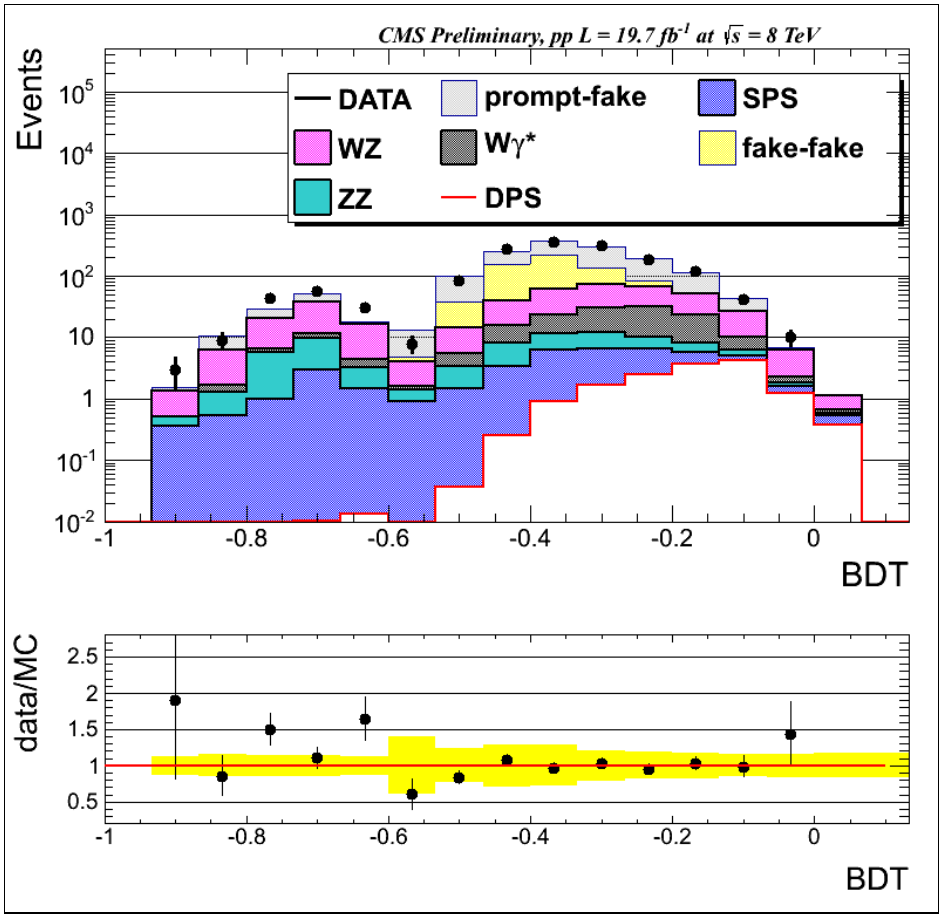


Figure 1. Distributions of the observables sensitive to DPS in same-sign selection, (a) leading muon transverse momentum, (b) sub-leading muon transverse momentum, (c) MET, (d) azimuthal separation between leading muon and MET, (e) Azimuthal separation between two muon, (f) Azimuthal separation between subleading muon and MET, (g) invariant trasverse mass of leading muon and projected MET , (h) invariant trasverse mass of subleading muon and projected MET, (i) two muons invariant transverse mass. Error band on histogram contains statistical uncertainties on data only. On the ratio plots the yellow bands are systematics uncertainties (described in section 5), while total statistical uncertainties (from both data and MC) are shown on black dot bars.



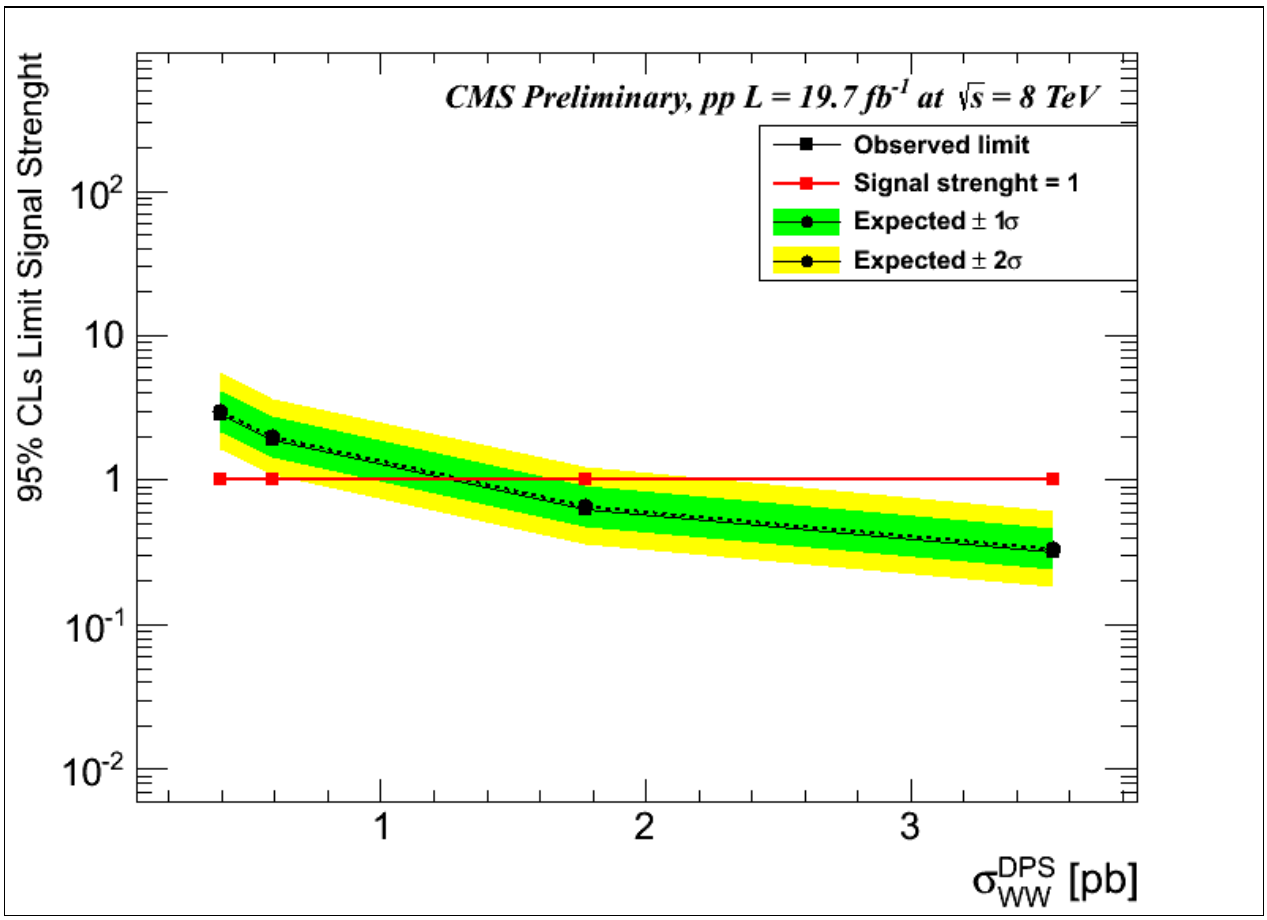


Figure 2. (a) BDT response for events passing offline base selection. On the ratio plots the yellow bands are systematics uncertainties (described in section 5), while total statistical uncertainties (from both data and MC) are shown on black dot bars. (b) DPS signal strength limit vs σ^{DPS}_{WW} for BDT response analysis.

-- DiegoCiangottini - 2015-10-23

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