SDC
SOLENOIDAL DETECTOR NOTES

SDC MUON PHYSICS ACCEPTANCE IMPACT IF DELETE THE FORWARD MUON SYSTEM

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The Isajet v6.24 Monte Carlo was used for muon acceptance studies for various muon benchmark physics processes summarized below.

Requirements on muons:
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a.) All muons to be in central (barrel) region, |eta_mu| < 1.5
b.) For W -> mu nu, muon with Pt > 20 GeV/c (~20% reduction)
c.) For Z0, Z' -> mu+mu-, at least one muon with Pt > 20 GeV/c
(~19%,~4%,~1.4% reduction for Z0, Z'(200) and Z'(500) respectively)
d.) For ZZ pairs, Higgs -> 4 mu, at least 2 muons with Pt > 20 GeV/c
(~0.7%, 0.4%, 1.1% reduction for ZZ pairs, H(400) and H(800) resp.)

[A] W+_ -> mu+_ nu

Sigma*B(W+_ -> mu+_ nu) = 34.7 nb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 80%; after Pt cut imposed, geometrical acceptance reduced from 58.0% (LoI) -> 35.5% (C-mu only)
=> 3.5 x 10**8 total events produced
=> 1.6 x 10**8 LoI (C-mu + I-mu) events
=> 9.9 x 10**7 C-mu only events

[B] Z0 -> mu+mu-

Sigma*B(Z0 -> mu+mu-) = 3.3 nb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 81%; after Pt cut imposed, geometrical acceptance reduced from 47.0% (LoI) -> 22.8% (C-C only)
=> 3.3 x 10**7 total events produced
=> 1.3 x 10**7 LoI (C-C + C-I + I-I) events
=> 6.1 x 10**6 C-C only events

[C] Z' -> mu+mu- (Mz' = 200 GeV/c2)

Sigma*B(Z' -> mu+mu-) = 144 pb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 96.1%; after Pt cut imposed, geometrical acceptance reduced from 48.0% (LoI) -> 21.8% (C-C only)
=> 1.4 x 10**6 total events produced
=> 6.6 x 10**5 LoI (C-C + C-I + I-I) events
=> 3.0 x 10**5 C-C only events

[D] Z' -> mu+mu- (Mz' = 500 GeV/c2)

Sigma*B(Z' -> mu+mu-) = 0.7 pb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 98.6%; after Pt cut imposed, geometrical acceptance reduced from 61.0% (LoI) -> 29.9% (C-C only)
=> 7000 total events produced
=> 4210 LoI (C-C + C-I + I-I) events
=> 2064 C-C only events

[E] ZZ pairs -> 4mu

Sigma*B(ZZ -> 4mu) = 25 fb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 99.3%; after Pt cut imposed, geometrical

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acceptance reduced from 32.2% (LoI) to 9.1% (C-C only)
=> 250.0 total events produced
=> 79.9 LoI events
=> 22.6 C-C C-C only events

[F] Higgs-> ZZ -> 4mu (Mh=400 GeV/c2)

Sigma*B(Higgs -> ZZ -> 4mu) = 8.8 fb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 99.6%; after Pt cut imposed, geometrical acceptance reduced from 49.2% (LoI) to 17.7% (C-C only)
=> 88.0 total events produced
=> 43.1 LoI events
=> 15.5 C-C C-C only events

[G] Higgs-> ZZ -> 4mu (Mh=800 GeV/c2)

Sigma*B(Higgs -> ZZ -> 4mu) = 1.5 fb L*dt = 10**40 (1 Year LT)
Pt > 20 GeV/c acceptance ~ 98.9%; after Pt cut imposed, geometrical acceptance reduced from 66.3% (LoI) to 29.7% (C-C only)
=> 15.0 total events produced
=> 9.8 LoI events
=> 4.4 C-C C-C events