EB032 Comments & Answers to

Search for Resonant Slepton Production

- Trigger bias for Muon efficiencies
- QCD estimation
- Factorization scale influence on the signal cross section
- Limit calculation
QCD estimation

Patrice/Pierre: More information, not totally convincing

C.A.: No QCD-MC, therefore estimation from data

Two different methods, both orthogonal to data/signal:

- **Isolation method**: Muons can be loose isolated
  - **advantage**: quite good statistics, not correlated with jets
  - **disadvantage**: Imperfect description of QCD (bbbar)
    low statistics in events with ≥ 2 jets

- **b-tag method**: A very loose b-tag is required
  - **advantage**: High statistics, especially in events with jets
    Good description of the missing QCD backgd.
  - **disadvantage**: Jet-multiplicity biased, due to b-tag req.

→ Solution: Use 1st to reweight the 2nd according to jet-mult.
  Both samples are orthogonal to data/signal!
QCD estimation

Most distributions similar for both QCD samples. These are the distributions with the largest differences:

Angle between Muon 1 and Jet 2

Transverse Momentum Jet 2
Jessica: muon *track matching* or *medium* efficiency can be biased if “probe” muon fires a trigger with this criterion

C.A.: require triggers without these criteria OR that the “tag” muon has fired such a trigger (implies matching of “tag” muon with L2/L3 object, that fulfills trigger req.)
Muon efficiency: Trigger bias

**Jessica:** Medium efficiency is similar to L1 muon trigger criterion. Differences to top medium efficiency

**C.A.:** Redid medium efficiency calculation with two different methods:

- With 2Muon events on the Z-peak (no possibility to ensure “probe” muon is not responsible for L1 trigger condition)
- On single muon events, trigger by a Cal. based trigger.

→ Both method consistent with efficiency correction in the note

→ Previous top correction was obtained on smaller dataset and for Pass 1 data
**Ryan:** Did you study any luminosity dependence for the muon isolation efficiency correction?

**C.A.:** No, but done by B. Tuchming:

- But this has no influence, since analysis sample and the sample on which the iso. eff. was calculated have the same luminosity profile!
- No cut influences the luminosity profile
- Syst. errors arise from differences in the profile

Units are: Inst. Lumi. $10^{31}$
$\sigma_{\text{slepton}}$ dependence on $\mu_f$ (Patrice)

$d\bar{d} \rightarrow \nu : \text{Scaled dependence (with CTEQ 4)}$

$\sqrt{s} = 1.96 \text{ TeV (pp)}$

**Smaller than 5% for complete mass range!**

$\sigma(\mu_t) / \sigma(\mu_t)_{\text{LO}}$

$\mu_f = m_{\nu}$

$\mu_f = \frac{m_{\nu}}{2}$

$\mu_f = m_{\nu}$

$\mu_f = 2 m_{\nu}$

$\mu_r = m_{\nu}$

$\nu \sim \frac{d}{d}\nu \sim \frac{m_{R}}{\mu_f} (\text{TeV})$

Smaller than 5% for complete mass range!
Limit calculation

**Currently:** Using LO $\sigma$ Susygen (CTEQ4L) and conservative estimated NLO k-factor (CTEQ4M)
Consistent with NLO calc. with CTEQ5 / 6.
Using $5\%$ uncertainty on $\sigma$ (PDF & $\mu_f$)

**Patrice:** Common practice summarized in Note 4618
Decrease $\sigma$ by it’s systematic errors

**C.A.:** Not done, yet.

**Patrice:** Use asymmetric errors for limit calculation

**C.A.:** Don’t know if it’s possible with TLimit (CLs)
Signal Efficiency as a function of \( m(\chi) \)

Marc Besancon: Signal selection efficiency as a function of the gaugino mass

C.A.: Signal eff. is basically a reflection of the model independent limit contour
Elemer/Ryan: Style of plots has to be improved, to make it readable in black & white printouts

C.A.: working on it, as soon as there are no more questions concerning the analysis (note) in general
Conclusions

Received many more comments and answered them.

Many thanks!

I hope that I could answer all open questions.

Would like to publish as soon as possible (writing PhD thesis).