Lepton+Track Trigger

- Davis: Maxwell Chertok, Alexei Safonov, Stephane Tourneur
- Texas A&M: Teruki Kamon, Vadim Khotilovich, Slava Krutelyov
- Osaka: Yukihiro Kato, Kazuhiro Yamamoto
- Paris: Aurore Savoy-Navarro
- Waseda: Takashi Ogawa

Req: e+track & μ+track

e+track:

non-isolated loose electron w/ PT>8 GeV & additional “pencil-like” isolated jet. (L1_CEM8_PT8, Stream B)

μ+track:

non-isolated loose muon w/ PT>8 GeV & additional “pencil-like” jet. (L1_CMU6_PT8, Stream J)

Main Objectives

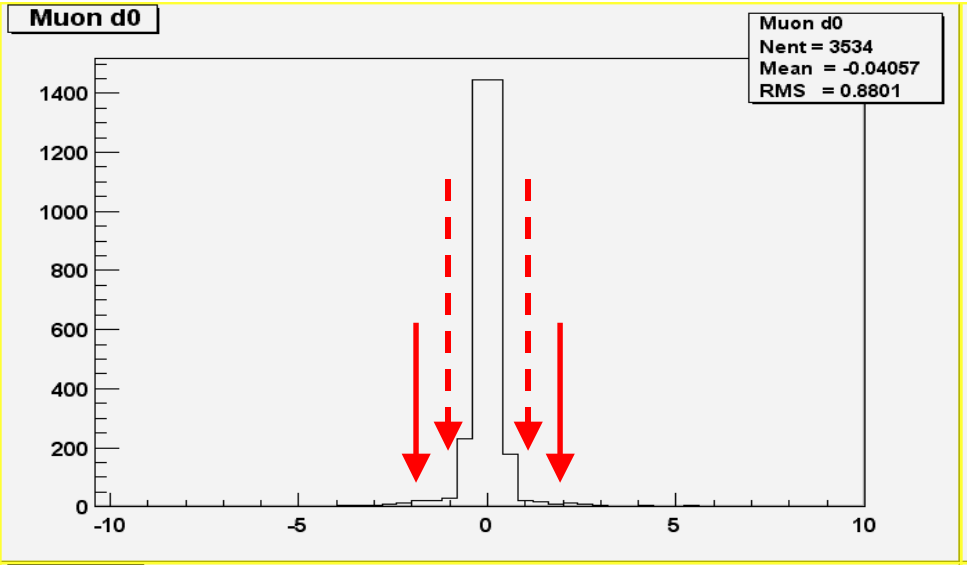
- Stripped data revealed a few significant backgrounds that increase the cross section a lot (especially for muons):
  - e+track:
    - Poorly reconstructed tracks (>30 % of the data)
  - muon+track:
    - Punch throughs
    - Dimuons from cosmics
- Main objective is to understand and minimize these backgrounds and get the cross section down:
  - Find good (but loose) cuts
- Validation of data:
  - Z-> mumu, ee
  - Comparisons to overlap triggers (e-mu etc.)

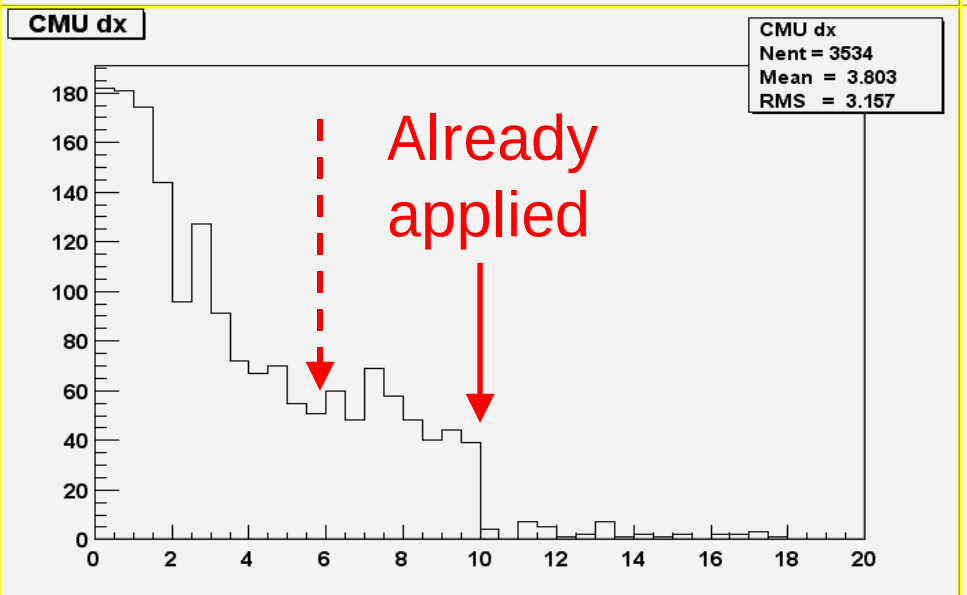
Muon Cut Parameter

	Temporary Cut	"Analysis" Cut
CMU Hits	>= 3	
CMP Hits	Required	>= 3 Hits
eta	CMU coverage	
|dx(CMU)|	< 10cm	→ 6cm?
d0	< 2cm	Recalculate w.r.t beam spot (<0.5cm?)
|z0-z0$_{track}$|	No required	< 12cm
EM	< 2GeV	
HAD	< 6GeV	
|z0-z0$_{vtx}$|	< 6cm	Can't be used at L3

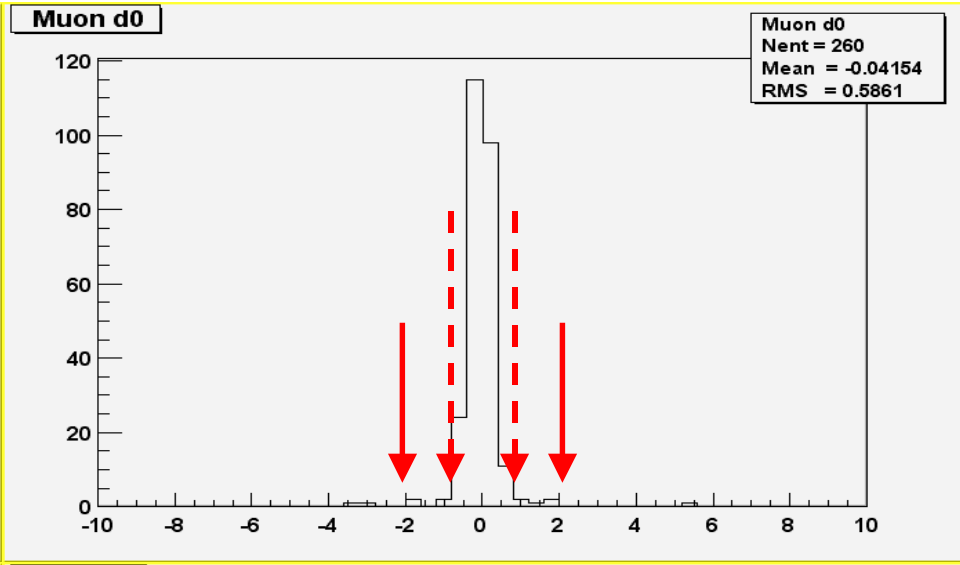
Muon Quality Cut (1)

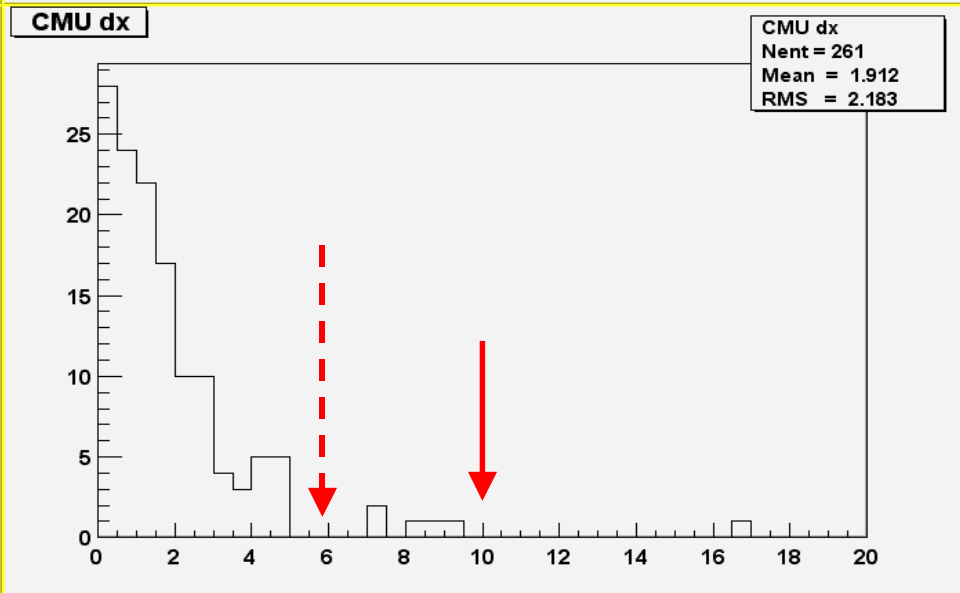
Before Cut





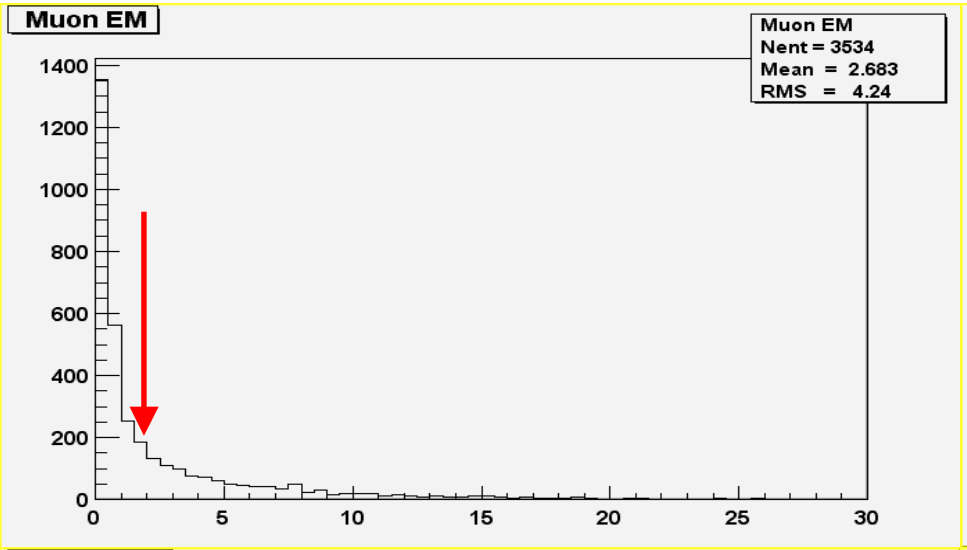
After Cut

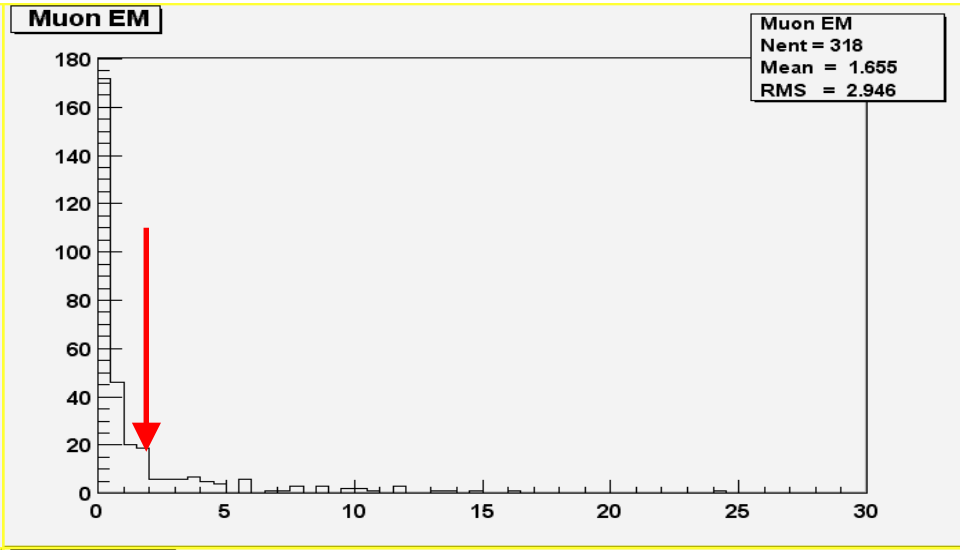


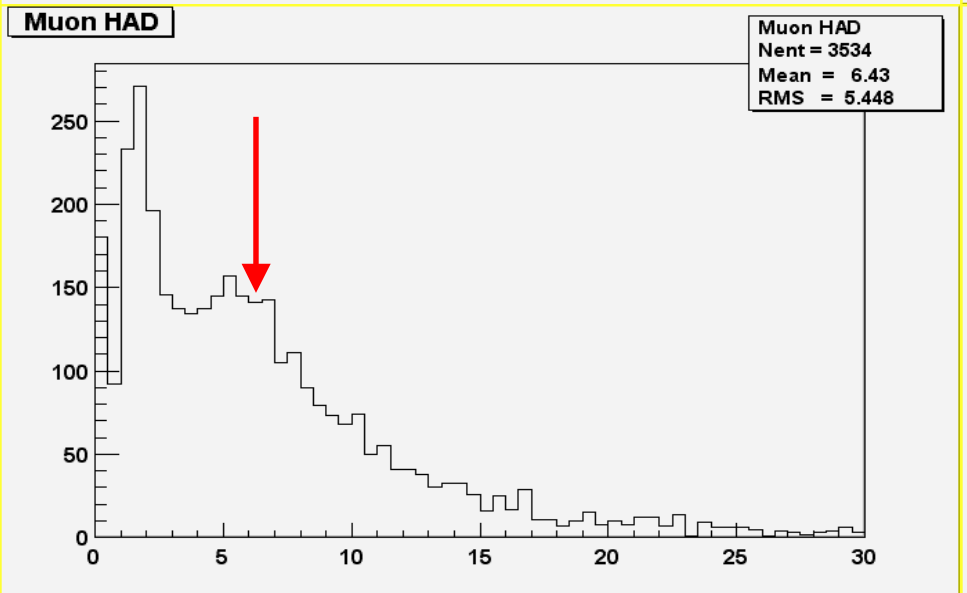


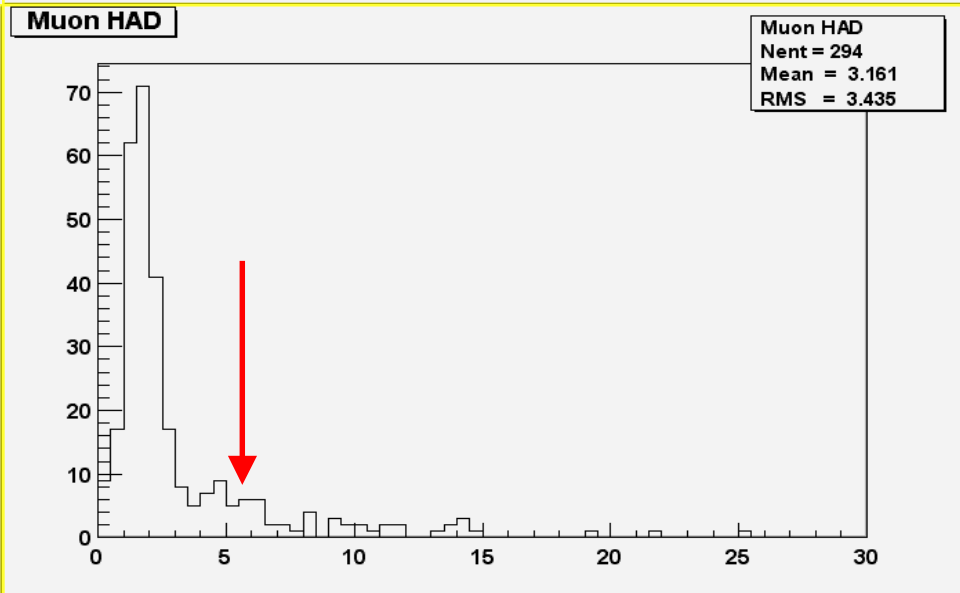
Muon Quality Cut (2)

Before Cut | **After Cut**







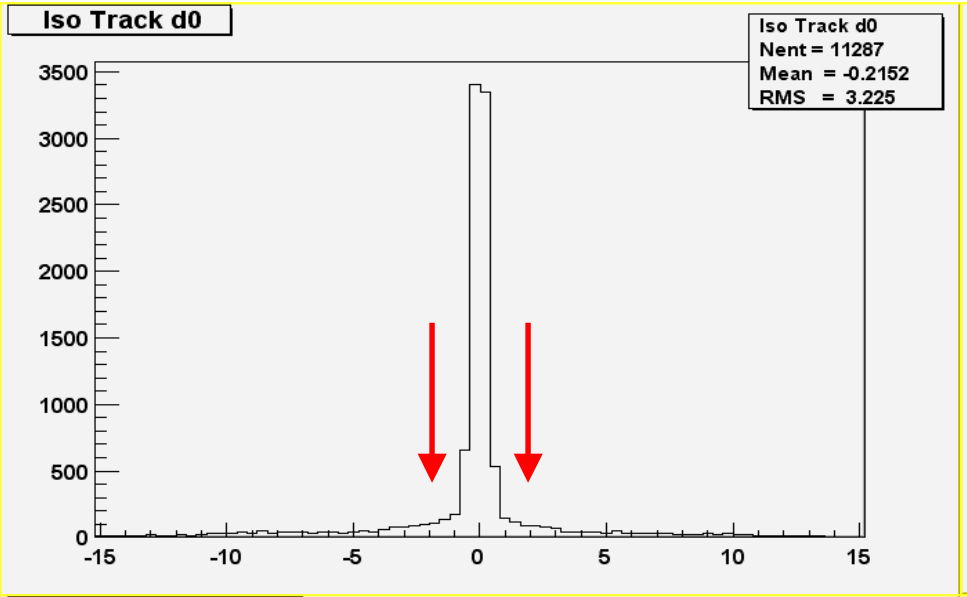


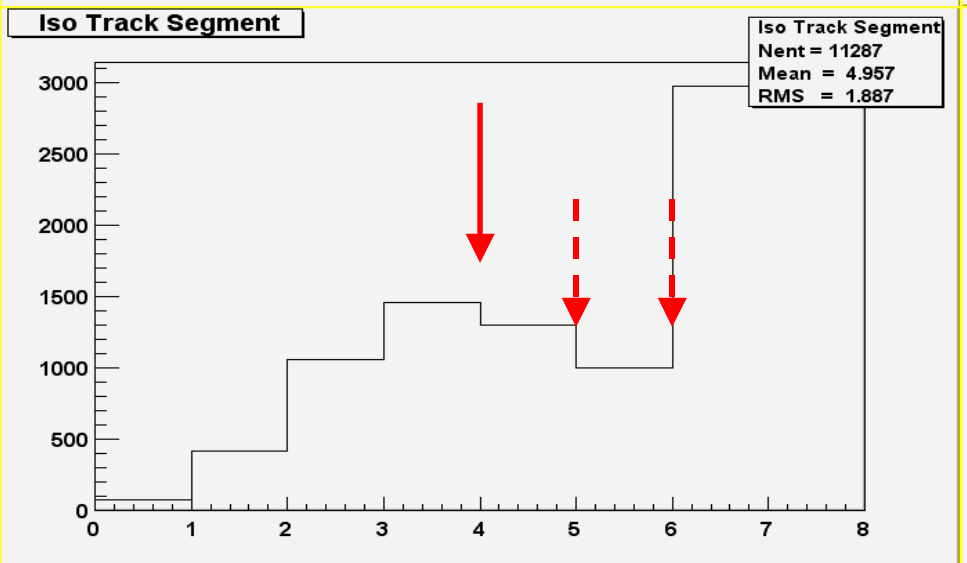
Iso.Track Cut Parameter

	Temporary Cut	Note
eta	1.5	
d0	2cm	Recalculate w.r.t beam spot (<0.5cm?)
$\lvert z0-z0_{mu} \rvert$	No required	<12cm
# of Segment	>= 4	When one SL gets >=4 Hits
$\lvert z0-z0_{vtx} \rvert$	< 6cm	Can't be used at L3

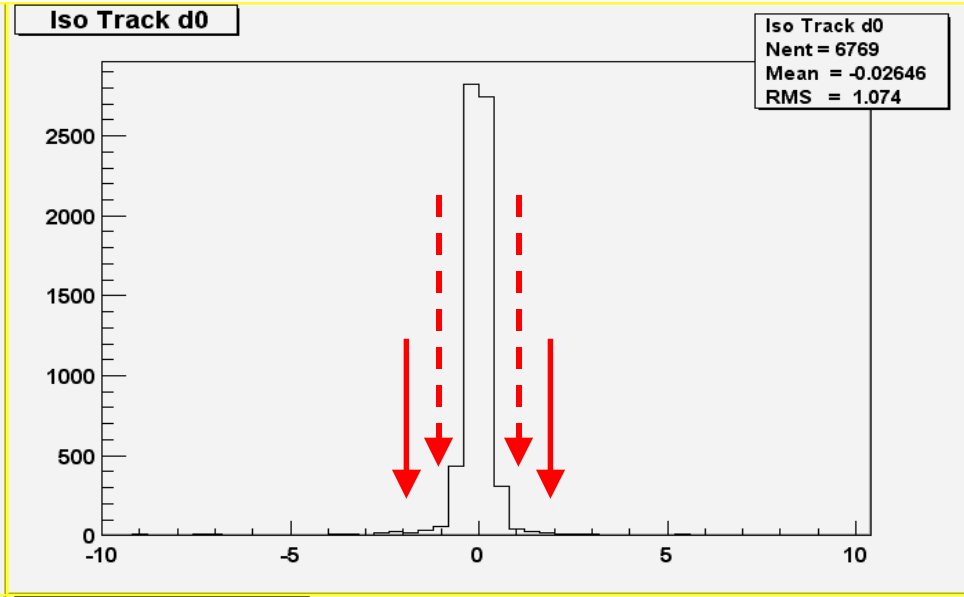
Iso. Track Quality Cut

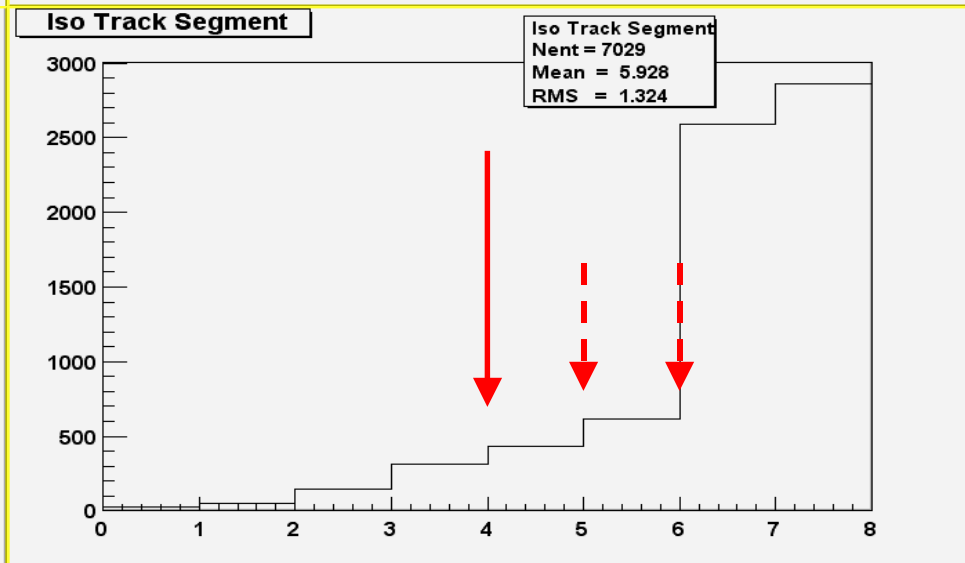
Before Cut





After Cut





Muon + track

Selection Type	Cut	Stripped Data	November Run	Jan Option1: improved default	Jan Option 2: CMU-CMP (kill punch-throughs)	Jan Option 3: "Strict" Option 1	Jan Option 4: Strict Option 2
Muon	**Stub**	Either of CMU, CMP, CMX, BMU	CMU	CMU	CMU+CMP	CMU	CMU+CMP
	PT (GeV)	8 GeV	8 GeV	> 8	> 8	> 8	> 8
	CMU Dx (cm)	10 cm	10 cm	< 10	< 10	< 6	< 6
	d0 (cm)	**None**	**None**	< 2	< 2	< 1	< 1
	Muon |eta|	**None**	|eta|~CMU	|eta|~CMU	|eta|~CMU	|eta|~CMU	|eta|~CMU
Isolated Track	**Seed Track PT**	5 GeV	5 GeV	5 GeV	5 GeV	5 GeV	5 GeV
	Seed Track eta	**None**	|eta| <1	|eta| <1	|eta| <1	|eta| <1	|eta| <1
	Isolation type	0.175<dR<0.524	0.175<dR<0.524	0.175<dR<0.524	0.175<dR<0.524	0.175<dR<0.524	0.175<dR<0.524
	Background track MaxPT	1.5 GeV	1.5 GeV	1.5 GeV	1.5 GeV	1.5 GeV	1.5 GeV
	Quality	**None**	**None**	**???**	**???**	**???**	**???**
	d0 (cm)	**None**	**None**	< 2	< 2	< 1	< 1
Matching	**Separation (muon, track)**	dR>0.175	dR>0.175	dR>0.175	dR>0.175	dR>0.175	dR>0.175
	dz=z0(trk)-z0(muon)	**None**	**None**	<12	<12	<12	<12
Cross-section:		**45 nb**	**35 nb**	**21 nb**	**8 nb**	**xx nb**	**xx nb**

Status

- Muon case: Takashi Ogawa (Waseda)
  - We know the backgrounds and have handles of getting rid of most of them. Can get to as low as 8-20 nb.
  - With the new trigger scheme, we can get the cross-section to reasonable values. But (!) large fraction of cosmics will still be there, standard Cosmics L3 filter is needed.
- Electron case: Stephane Tourneur (Davis)
  - started working on this. Will pursue the same approach as for muons.
  - First results will come soon. Preliminary, track quality requirements will get cross-section down from ~40 nb to less then 30.

Summary

- We consider going through December with L3 being slightly improved version of the stripping filters.
  - e+track: $\sigma \sim$ 40 nb, mu+track: $\sigma \sim$ 35 nb
- In January, when TwoTrackL3Filter is in:
  - e+track: $\sigma <$ 30 nb (preliminary), mu+track: $\sigma \sim$ 10-20 nb
- With muons, we understand most of cuts in this case and started looking for $Z \rightarrow \mu\mu$, and then $Z \rightarrow \mu\tau$ in order to validate data and cuts (Takashi Ogawa).
- Similar strategy with electrons (Stephane Tourneur).