Energy Absorption in Collimation Section

1. Absorbers and PC's are 30 cm long CU (21 r.l.)
2. PC's are 0.5 cm radius
3. Spoilers are 1/4 r.l. CU, vertical spoilers are 234 μ(0.0234 cm) half gap, horizontal spoilers are 211 μ half gap.
4. Start beam 16 μ from the edge of the first vertical spoiler. Use EGSA to see where the energy is distributed in the 520 m betatron collimation section for 3 absorber radii.

<table>
<thead>
<tr>
<th>Absorber radius</th>
<th>Absorbers</th>
<th>PC's (0.6 cm rad)</th>
<th>Tunnel walls</th>
<th>Into downstream beam line</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 cm</td>
<td>71.95%</td>
<td>19.55%</td>
<td>3.48%</td>
<td>1.04%</td>
</tr>
<tr>
<td>0.2</td>
<td>83.91</td>
<td>10.24</td>
<td>2.46</td>
<td>0.83</td>
</tr>
<tr>
<td>0.1</td>
<td>89.17</td>
<td>8.25</td>
<td>1.31</td>
<td>0.46</td>
</tr>
</tbody>
</table>
Phase Space Distributions at End of Betatron Collimation Sector

$E_{\text{beam}} = 500 \text{ GeV}$, Source is 1st $\frac{1}{4}$ n.t. Vertical spoiler

Energy cutoff is $420 \text{ GeV} (\delta = -16\%)$

Result: $177 / 2,000,000$ to beginning of IP switch

i.e. $10^9 \rightarrow 2 \times 10^5$

of these $\approx 65\%$ hit quads in final focus
Betatron Collimation Conclusions

1. Can contain > 95% of scattered tails in absorbers and protection collimators

2. With the beam tail on the most outboard spoiler, get a reduction of $10^{-4}$ at the beginning of IP switch, 65% of the remainder impacts guards in the EP.

Very tentative, needs checking
Source locations for March 2000 short PR 2DR collimation

Energy and betatron collimation

14' diameter round tunnel

Detector small

(2DR (z' coordinate)
(BEAM LOST)/(MUON REACHING MUON ENDCAP)

Source Location (Meters from IP)

Focus
Final
Bend
Combination Section

Beam Loss Estimated

\[ E_{beam} = 250 \text{ GeV} \]

Muon Endcap (Small Detector)

at \( z = -271 \text{ m}, -1151 \text{ m} \)

9\% Full Tunnel Spoilers +

No Magnetic Spoilers —

1.02 x 10^6
1.04
1.06
1.08
1.10
1.12
(BEAM LOST)/(MUON REACHING MUON ENDCAP)

Source Location (Meters from IP)

Focus

Beam Loss

Estimates

Large Detector

9m Full Tunnel Spoilers +
No Magnetic Spoilers

E_{beam} = 500 GeV

Muon Endcap (Small Detector)
(BEAM LOST) \( \rightarrow \) (MUON REACHING MUON ENDCAP)

\[ \text{Source Location (Metres from IP)} \]

- Final
- Big Bend
- Comission Section

\[ \text{at } z = -87 \text{ m} \rightarrow 115 \text{ m} \]

- + 9m Pull Tunnel Spillovers
- No Magnetic Spillovers

- Beam Loss
- Best Measured

\[ E_{\text{beam}} = 250 \text{ GeV} \]

EM CALORIMETER (Small Vertexor)
(BEAM LOST)/(MUON REACHING MUON ENDCAP)

No Magnetic Spoilers
at $z = -271$ m, -1151 m

EM CALORIMETER (Small Detector)
$E_{\text{beam}} = 500$ GeV
Muon Background Conclusions

1. At 500 GeV EM:
   < 1 μ/pulse train in small detector endcap
   and EM calorimeter

2. At 1 TeV EM:
   a) ~ 10 μ/pulse train in small detector endcap
      and ~ 30 μ/pulse train in large detector endcap
   b) < 1μ/train in small detector EM calorimeter
      and ~10μ/train in large detector EM calorimeter