

# CEPC LumiCal group meeting

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# Comparison

@92.3 GeV

|               | CMS generated<br>Th1, Th2 (mRad) | $e^-$ .or. $e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) (mm) |                  | Both $e^-$ .and. $e^+$ in<br>(mm) (mm) |                  |
|---------------|----------------------------------|------------------------------------------|------------------------------|------------------|----------------------------------------|------------------|
| $\sigma$ (nb) | 10 to 80                         | $10 < r,  y  < 80$                       | $r > 20$                     | .and. $ y  > 20$ | $r > 20$                               | .and. $ y  > 20$ |
|               | 1172.45                          | 1217.45                                  | 217.20                       | 137.46           | 140.74                                 | 131.21           |
| $\sigma$ (nb) | 10 to 80                         | $10 < r,  y  < 80$                       | $r > 25$                     | .and. $ y  > 25$ | $r > 25$                               | .and. $ y  > 25$ |
|               | 1172.45                          | 1217.45                                  | 133.42                       | 82.20            | 85.89                                  | 78.08            |
| $\sigma$ (nb) | 10 to 120                        | $10 < r,  y  < 120$                      | $r > 25$                     | .and. $ y  > 25$ | $r > 25$                               | .and. $ y  > 25$ |
|               | 1181.94                          | 1226.98                                  | 144.59                       | 91.34            | 96.94                                  | 87.18            |

|               | CMS generated<br>Th1, Th2(mrad) | $e^-$ .or. $e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                            | Both $e^-$ .and. $e^+$ in<br>(mm) |                            |
|---------------|---------------------------------|------------------------------------------|-------------------------|----------------------------|-----------------------------------|----------------------------|
| $\sigma$ (nb) | 10 to 80<br>1172.45             | $10 < r,  y  < 80$<br>1242.98            | $20 < r$<br>290.26      | .and. $ y  > 20$<br>137.20 | $20 < r$<br>287.31                | .and. $ y  > 20$<br>131.11 |
| $\sigma$ (nb) | 10 to 80<br>1172.45             | $10 < r,  y  < 80$<br>1242.98            | $25 < r$<br>178.70      | .and. $ y  > 25$<br>81.98  | $25 < r$<br>170.73                | .and. $ y  > 25$<br>77.99  |
| $\sigma$ (nb) | 10 to 120<br>1181.94            | $10 < r,  y  < 120$<br>1252.38           | $25 < r$<br>189.81      | .and. $ y  > 25$<br>91.13  | $25 < r$<br>181.88                | .and. $ y  > 25$<br>87.05  |

# Comparison

@91 GeV (BHLUMI)

|               | CMS generated<br>Th1, Th2(mrad) | $e^- . or . e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                              | Both $e^- . and e^+$ in<br>(mm) |                              |
|---------------|---------------------------------|------------------------------------------|-------------------------|------------------------------|---------------------------------|------------------------------|
| $\sigma$ (nb) | 10 to 80<br>1206.67             | $10 < r,  y  < 80$<br>1279.09            | $20 < r$<br>299.21      | $. and .  y  > 20$<br>141.52 | $20 < r$<br>286.90              | $. and .  y  > 20$<br>135.25 |
| $\sigma$ (nb) | 10 to 80<br>1206.67             | $10 < r,  y  < 80$<br>1279.09            | $25 < r$<br>184.40      | $. and .  y  > 25$<br>84.64  | $25 < r$<br>176.19              | $. and .  y  > 25$<br>80.52  |
| $\sigma$ (nb) | 10 to 120<br>1216.68            | $10 < r,  y  < 120$<br>1288.97           | $25 < r$<br>195.90      | $. and .  y  > 25$<br>94.14  | $25 < r$<br>187.75              | $. and .  y  > 25$<br>89.95  |

```
CMS :91.00000000000000[GeV]
The total number of events : 10000000.000000000000000
The total cross section : 2631.190389271412641
th1 :0.0100000000000000[Rad]
th2 :0.1200000000000000[Rad]
nevent1_cut1 : 4624080.0000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4916897.0000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 761785.0000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 372047.0000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 729973.0000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 355946.0000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
Cross Section 1 : 1216.683485522215278[nb]
Cross Section 2 : 1293.729213143744118[nb]
Cross Section 3 : 200.440137069112296[nb]
Cross Section 4 : 97.892649075726126[nb]
Cross Section 5 : 192.069794202762097[nb]
Cross Section 6 : 93.656169429960215[nb]
Beam_Lab : (16.501497538082106, 0.0000000000000000, 1000.0000000000000000)
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```
Xcru, AWT, DWT, Xcru*AWT= 2631.1903892714126 5.3
NevTot = 10000000
Theta Th1,Th2 (mRad)= 1.0000000000000000E-002 0.12000
NevTot Sum WtMod SumAllWt = 10000000.000000000
NthBARE1(th=Th1,Th2) SthBARE1Wt = 4846681.000000000
NevBARE1 1-sp/s lt .5 SevBARE1Wt = 4624080.000000000
NthBARE1(th=Th1,Th2) = 4846681
NevBARE1 1-sp/s lt .5= 4624080
NrjBARE1 1-sp/s nlt.5= 222601
Xcru*NevBare1/NevTot = 1216.683485522155
```

# Comparison

@240 GeV (BHLUMI)

|               | CMS generated<br>Th1, Th2(mrad) | $e^-$ . or $e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                            | Both $e^-$ . and $e^+$ in<br>(mm) |                            |
|---------------|---------------------------------|------------------------------------------|-------------------------|----------------------------|-----------------------------------|----------------------------|
| $\sigma$ (nb) | 10 to 80<br>174.33              | $10 < r,  y  < 80$<br>186.10             | $20 < r$<br>43.48       | . and. $ y  > 20$<br>20.58 | $20 < r$<br>41.49                 | . and. $ y  > 20$<br>19.56 |
| $\sigma$ (nb) | 10 to 80<br>174.33              | $10 < r,  y  < 80$<br>186.10             | $25 < r$<br>26.81       | . and. $ y  > 25$<br>12.31 | $25 < r$<br>25.50                 | . and. $ y  > 25$<br>11.65 |
| $\sigma$ (nb) | 10 to 120<br>175.99             | $10 < r,  y  < 120$<br>187.75            | $25 < r$<br>28.51       | . and. $ y  > 25$<br>13.72 | $25 < r$<br>27.21                 | . and. $ y  > 25$<br>13.03 |

```

CMS :240.00000000000000[GeV]
The total number of events : 10000000.000000000000000
The total cross section : 382.577777244586741
th1 :0.0100000000000000[Rad]
th2 :0.0800000000000000[Rad]
nevent1_cut1 : 4556688.000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4904724.000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 1174783.000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 568041.000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 1121047.000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 539053.000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
Cross Section 1 : 174.32875666370813[nb]
Cross Section 2 : 187.643840591817849[nb]
Cross Section 3 : 44.944586888472735[nb]
Cross Section 4 : 21.731986316379231[nb]
Cross Section 5 : 42.888766944671225[nb]
Cross Section 6 : 20.622969855702625[nb]
Beam Lab : (16.501497538082106, 0.000000000000000, 1000.000000000000000)

```

```

Xcru, AWT, DWT, Xcru*AWT= 382.57777724458674 5.
NevTot = 10000000
Theta Th1,Th2 (mRad)= 1.0000000000000000E-002 8.000
NevTot Sum WtMod SumAllWt = 10000000.000000000
NthBARE1(th=Th1,Th2) SthBARE1Wt = 4794737.000000000
NevBARE1 1-sp/s lt .5 SevBARE1Wt = 4556688.000000000
NthBARE1(th=Th1,Th2) = 4794737
NevBARE1 1-sp/s lt .5= 4556688
NrjBARE1 1-sp/s nlt.5= 238049
Xcru*NevBare1/NevTot = 174.32875666370813

```

# Comparison

@92.3 GeV

th1 = 0.01,  
th2 = 0.08 or 0.12,  
thmin = 0.7\* th1,  
thmax = 2\*th2

|               | CMS generated<br>Th1, Th2(mrad) | $e^- . or . e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                             | Both $e^- . and e^+$ in<br>(mm) |                             |
|---------------|---------------------------------|------------------------------------------|-------------------------|-----------------------------|---------------------------------|-----------------------------|
| $\sigma$ (nb) | 10 to 80<br>1172.45             | $10 < r,  y  < 80$<br>1242.98            | $20 < r$<br>290.26      | . and. $ y  > 20$<br>137.20 | $20 < r$<br>287.31              | . and. $ y  > 20$<br>131.11 |
| $\sigma$ (nb) | 10 to 80<br>1172.45             | $10 < r,  y  < 80$<br>1242.98            | $25 < r$<br>178.70      | . and. $ y  > 25$<br>81.98  | $25 < r$<br>170.73              | . and. $ y  > 25$<br>77.99  |
| $\sigma$ (nb) | 10 to 120<br>1181.94            | $10 < r,  y  < 120$<br>1252.38           | $25 < r$<br>189.81      | . and. $ y  > 25$<br>91.13  | $25 < r$<br>181.88              | . and. $ y  > 25$<br>87.05  |

| ReneSANCe     | CMS generated<br>Th1, Th2(mrad) | $e^- . or . e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                             | Both $e^- . and e^+$ in<br>(mm) |                             |
|---------------|---------------------------------|------------------------------------------|-------------------------|-----------------------------|---------------------------------|-----------------------------|
| $\sigma$ (nb) | 10 to 80<br>1223.68             | $10 < r,  y  < 80$<br>1333.88            | $20 < r$<br>351.78      | . and. $ y  > 20$<br>172.22 | $20 < r$<br>330.31              | . and. $ y  > 20$<br>156.61 |
| $\sigma$ (nb) | 10 to 80<br>1223.68             | $10 < r,  y  < 80$<br>1333.88            | $25 < r$<br>225.85      | . and. $ y  > 25$<br>106.96 | $25 < r$<br>211.31              | . and. $ y  > 25$<br>96.64  |
| $\sigma$ (nb) | 10 to 120<br>1240.96            | $10 < r,  y  < 120$<br>1351.72           | $25 < r$<br>242.87      | . and. $ y  > 25$<br>121.11 | $25 < r$<br>228.46              | . and. $ y  > 25$<br>110.69 |

th1 = 0.007,  
thmin = th1,  
thmax = PI / 2

# Comparison

@92.3 GeV

th1 = 0.007,  
th2 =  $\text{PI} / 2$ ,  
thmin = th1,  
thmax = th2

| BHLUMI        | CMS generated<br>Th1, Th2(mrad) | $e^- . or . e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                             | Both $e^- . and e^+$ in<br>(mm) |                             |
|---------------|---------------------------------|------------------------------------------|-------------------------|-----------------------------|---------------------------------|-----------------------------|
| $\sigma$ (nb) | 10 to 80<br>1171.55             | $10 < r,  y  < 80$<br>1241.93            | $20 < r$<br>290.17      | . and. $ y  > 20$<br>137.32 | $20 < r$<br>278.17              | . and. $ y  > 20$<br>131.13 |
| $\sigma$ (nb) | 10 to 80<br>1171.55             | $10 < r,  y  < 80$<br>1241.93            | $25 < r$<br>178.69      | . and. $ y  > 25$<br>81.96  | $25 < r$<br>170.75              | . and. $ y  > 25$<br>77.92  |
| $\sigma$ (nb) | 10 to 120<br>1182.88            | $10 < r,  y  < 120$<br>1253.27           | $25 < r$<br>190.01      | . and. $ y  > 25$<br>91.26  | $25 < r$<br>182.06              | . and. $ y  > 25$<br>87.12  |

| ReneSANCe     | CMS generated<br>Th1, Th2(mrad) | $e^- . or . e^+$ to pipe<br>centers (mm) | Single $e^-$ in<br>(mm) |                             | Both $e^- . and e^+$ in<br>(mm) |                             |
|---------------|---------------------------------|------------------------------------------|-------------------------|-----------------------------|---------------------------------|-----------------------------|
| $\sigma$ (nb) | 10 to 80<br>1223.68             | $10 < r,  y  < 80$<br>1333.88            | $20 < r$<br>351.78      | . and. $ y  > 20$<br>172.22 | $20 < r$<br>330.31              | . and. $ y  > 20$<br>156.61 |
| $\sigma$ (nb) | 10 to 80<br>1223.68             | $10 < r,  y  < 80$<br>1333.88            | $25 < r$<br>225.85      | . and. $ y  > 25$<br>106.96 | $25 < r$<br>211.31              | . and. $ y  > 25$<br>96.64  |
| $\sigma$ (nb) | 10 to 120<br>1240.96            | $10 < r,  y  < 120$<br>1351.72           | $25 < r$<br>242.87      | . and. $ y  > 25$<br>121.11 | $25 < r$<br>228.46              | . and. $ y  > 25$<br>110.69 |

th1 = 0.007,  
thmin = th1,  
thmax =  $\text{PI} / 2$

# Comparison

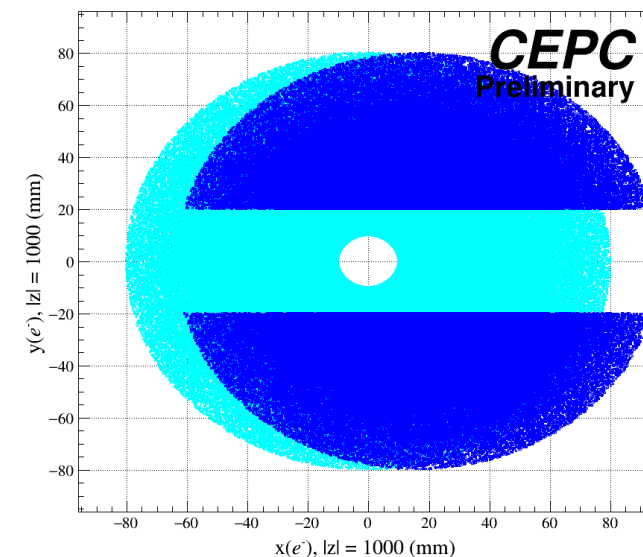
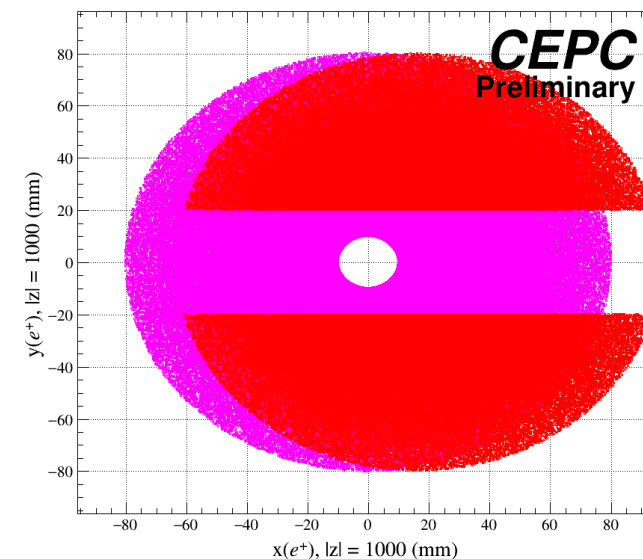
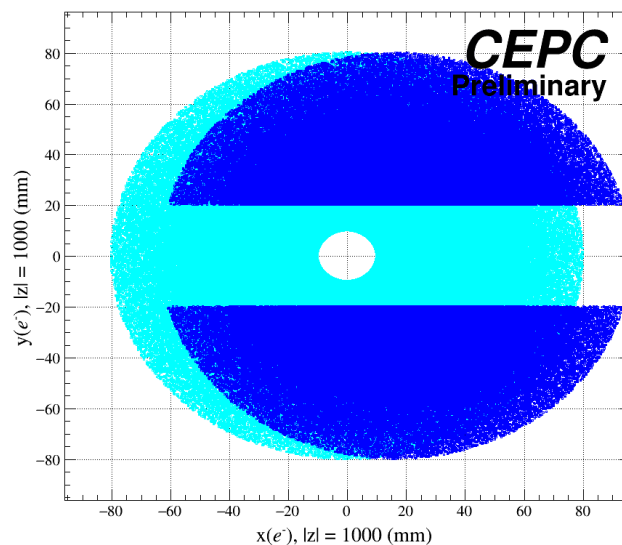
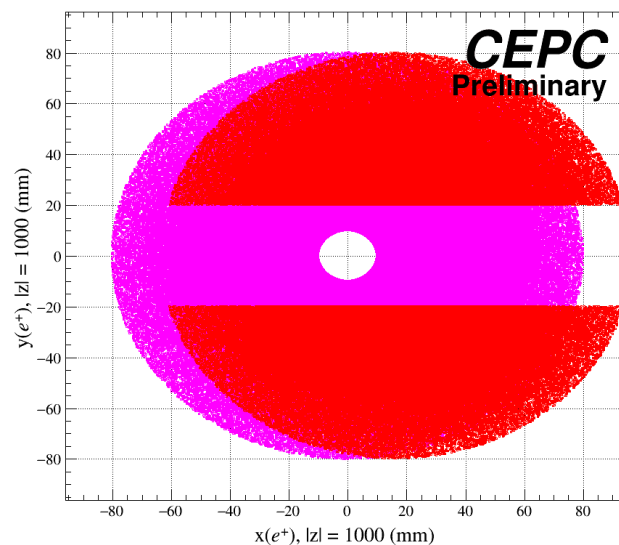
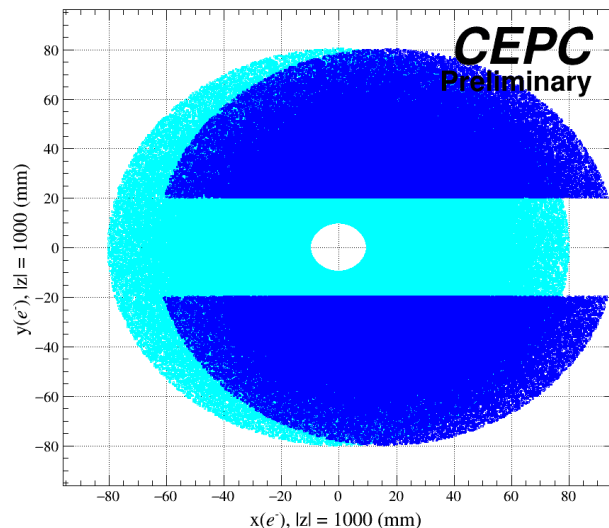
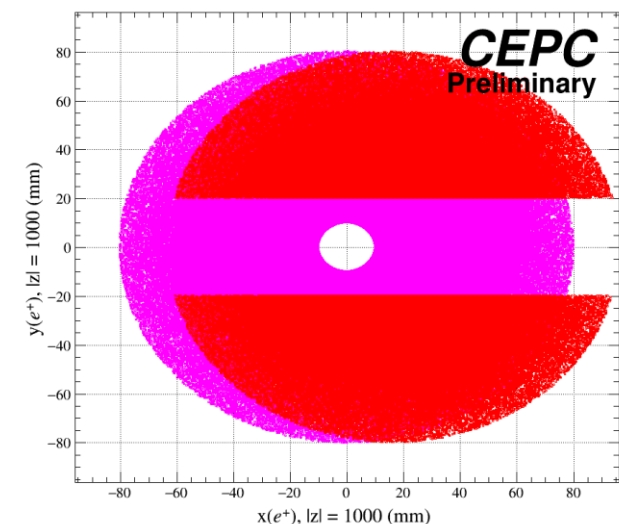
BHLUMI

@92.3 GeV

@240 GeV

Both  
 $e^-$  and  $e^+$  in  
 (mm)  
 $20 < r < 80$   
 and  $|y| > 20$

@91 GeV



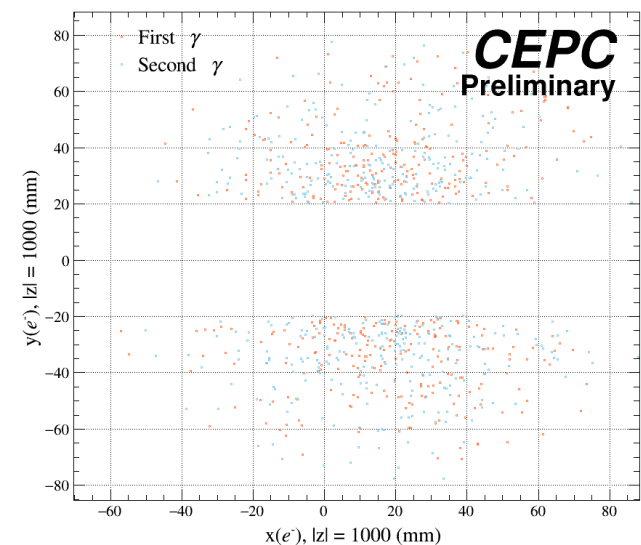
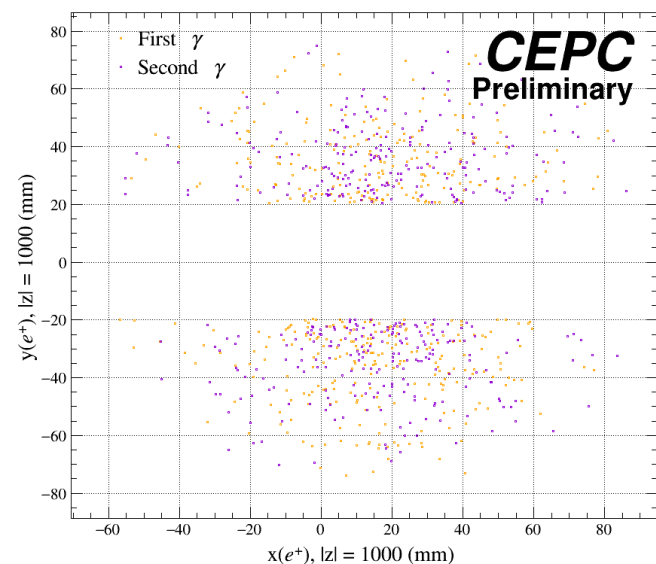
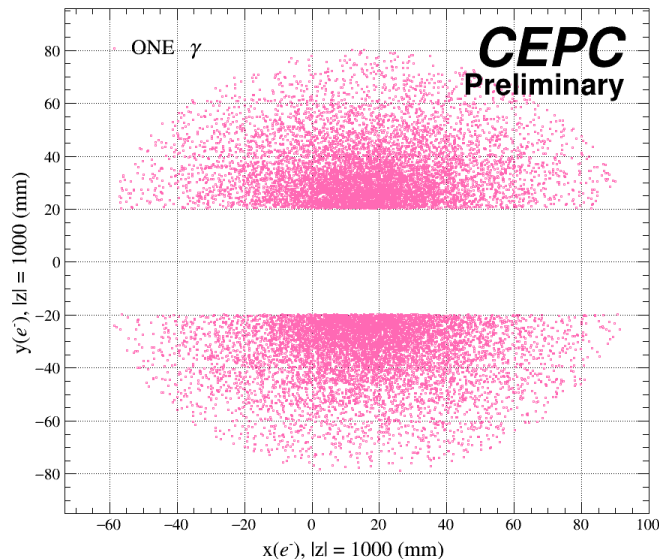
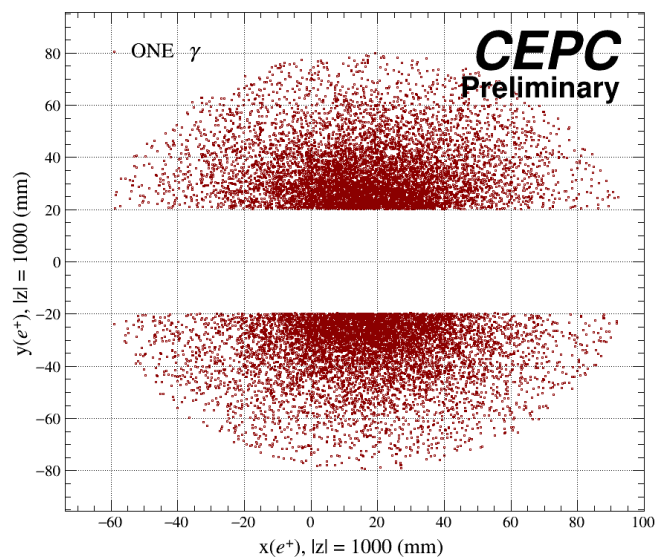
# Comparison

BHLUMI

@92.3 GeV

$$E_\gamma > 0.1 \text{ GeV}$$

$$\theta_{\gamma e^\pm} > 0.005 \text{ rad}$$



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Number of points in the scatter plot (e+) (ONE)      : 15595
Number of points in the scatter plot (e-) (ONE)      : 15584
Number of points in the scatter plot (e+) (TWO) (FIRST) : 444
Number of points in the scatter plot (e-) (TWO) (FIRST) : 429
Number of points in the scatter plot (e+) (TWO) (SECOND) : 423
Number of points in the scatter plot (e-) (TWO) (SECOND) : 450
CMS : 92.29999999999997[GeV]
The total number of events : 10000000.0000000000000000
The total cross section   : 2556.516055683488958
th1 : 0.0100000000000000[Rad]
th2 : 0.0800000000000000[Rad]
nevent1_cut1 : 4586137.0000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4862012.0000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 1135362.0000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 536663.0000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 1088625.0000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 512839.0000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
nevent1_cut7 : 31179.0000000000000000 ONE photon can be observed.
nevent1_cut8 : 873.0000000000000000 TWO photons can be observed.
nevent1_cut9 : 480787.0000000000000000 NO photon can be observed.
Cross Section 1 : 1172.453287406410936[nb]
Cross Section 2 : 1242.981174092579067[nb]
Cross Section 3 : 290.257118201291746[nb]
Cross Section 4 : 137.198757599126822[nb]
Cross Section 5 : 278.308729111843832[nb]
Cross Section 6 : 131.108113748066472[nb]
Cross Section 7 : 7.970961410015549[nb]
Cross Section 8 : 0.223183851661169[nb]
Cross Section 9 : 122.913968486389763[nb]
Beam Lab : (16.501497538082106, 0.0000000000000000, 1000.0000000000000000)

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