

CEPC LumiCal group meeting

Jiading Gong, Renjie Ma

BHLUMI

@92.3 GeV BHLUMI 4.04

th1 = 0.01,
th2 = 0.08 or 0.12,
thmin = 0.7* th1,
thmax = 2*th2
Infrared Cut = 1e-04
NevTot=1e+07

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

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

BHLUMI

@91 GeV (BHLUMI)

th1 = 0.01,
th2 = 0.08 or 0.12,
thmin = 0.7* th1,
thmax = 2*th2
Infrared Cut = 1e-04
NevTot=1e+07

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

```

CMS :91.0000000000000000[GeV]
The total number of events : 10000000.0000000000000000
The total cross section : 2631.190389271412641
th1 :0.010000000000000000[Rad]
th2 :0.120000000000000000[Rad]
nevent1_cut1 : 4624080.0000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4898814.0000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 744524.0000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 357782.0000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 713545.0000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 341864.0000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
Cross Section 1 : 1216.683485522215278[nb]
Cross Section 2 : 1288.971231562824642[nb]
Cross Section 3 : 195.898439338190940[nb]
Cross Section 4 : 94.139255985430466[nb]
Cross Section 5 : 187.747274631267004[nb]
Cross Section 6 : 89.950927123788219[nb]
Beam Lab : (16.501497538082106, 0.0000000000000000, 1000.0000000000000000)

```

```

Xcru, AWT, DWT, Xcru*AWT= 2631.1903892714126 5.3
NevTot = 10000000
Theta Th1,Th2 (mRad)= 1.0000000000000000E-002 0.1200000000000000
NevTot Sum WtMod SumAllWt = 10000000.0000000000
NthBARE1(th=Th1,Th2) SthBARE1Wt = 4846681.0000000000
NevBARE1 1-sp/s lt .5 SevBARE1Wt = 4624080.0000000000
NthBARE1(th=Th1,Th2) = 4846681
NevBARE1 1-sp/s lt .5= 4624080
NrjBARE1 1-sp/s nlt.5= 222601
Xcru*NevBare1/NevTot = 1216.6834855222155

```

BHLUMI

@240 GeV (BHLUMI)

th1 = 0.01,
th2 = 0.08 or 0.12,
thmin = 0.7* th1,
thmax = 2*th2
Infrared Cut = 1e-04
NevTot=1e+07

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

```

CMS :240.00000000000000[GeV]
The total number of events : 10000000.0000000000000000
The total cross section : 382.577777244586741
th1 :0.0100000000000000[Rad]
th2 :0.0800000000000000[Rad]
nevent1_cut1 : 4556688.0000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4864364.0000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 1136388.0000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 537859.0000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 1084565.0000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 511207.0000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
Cross Section 1 : 174.328756663708134[nb]
Cross Section 2 : 186.099756682858697[nb]
Cross Section 3 : 43.475679512742140[nb]
Cross Section 4 : 20.577290069099618[nb]
Cross Section 5 : 41.493046697727522[nb]
Cross Section 6 : 19.557643777187344[nb]
Beam_Lab : (16.501497538082106, 0.0000000000000000, 1000.0000000000000000)

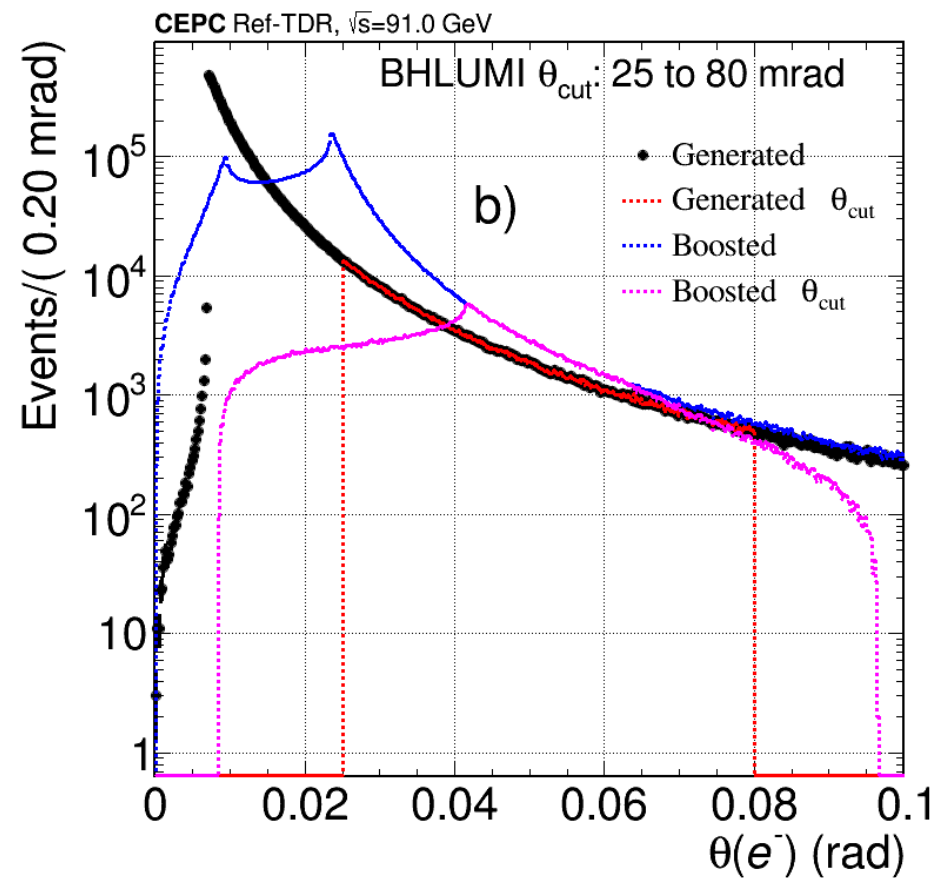
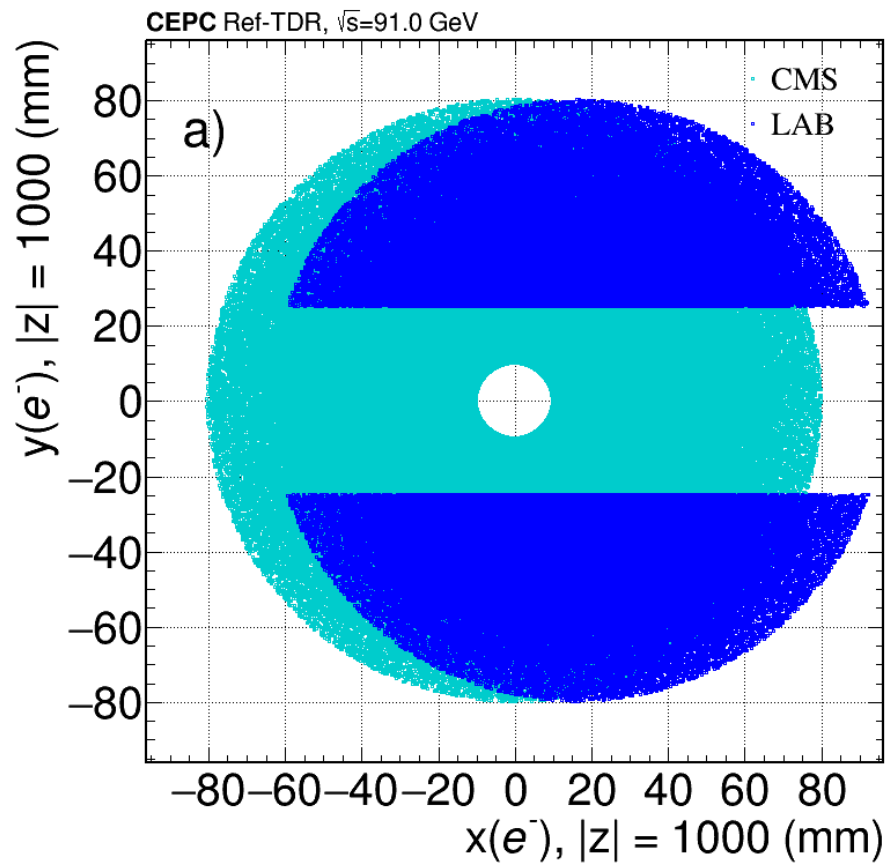
```

```

Xcru, AWT, DWT, Xcru*AWT= 382.57777724458674 5.
NevTot = 10000000
Theta Th1,Th2 (mRad)= 1.0000000000000000E-002 8.000
NevTot Sum WtMod SumAllWt = 10000000.0000000000
NthBARE1(th=Th1,Th2) SthBARE1Wt = 4794737.0000000000
NevBARE1 1-sp/s lt .5 SevBARE1Wt = 4556688.0000000000
NthBARE1(th=Th1,Th2) = 4794737
NevBARE1 1-sp/s lt .5= 4556688
NrjBARE1 1-sp/s nlt.5= 238049
Xcru*NevBare1/NevTot = 174.32875666370813

```

BHLUMI



$$\sigma = 80.52 \text{ nb}$$

BHLUMI

BHLUMI

th1 = 0.01,

th2 = 0.08 or 0.12,

thmin = 0.7* th1,

thmax = 2*th2

Infrared Cut = 1e-04

NevTot=1e+07

	CMS (GeV)	Both e^- and e^+ in (mm)		ONE PHOTON	TWO PHOTON	NONE
σ (nb)	92.3	$20 < r$ 287.31	.and. $ y > 20$ 131.11	7.97 (6.08%)	0.22 (0.17%)	122.91 (93.75%)
σ (nb)	240	$20 < r$ 41.49	.and. $ y > 20$ 19.56	1.35 (6.91%)	0.04 (0.20%)	18.17 (92.89%)

```

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) (FIEST) : 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)

```

```

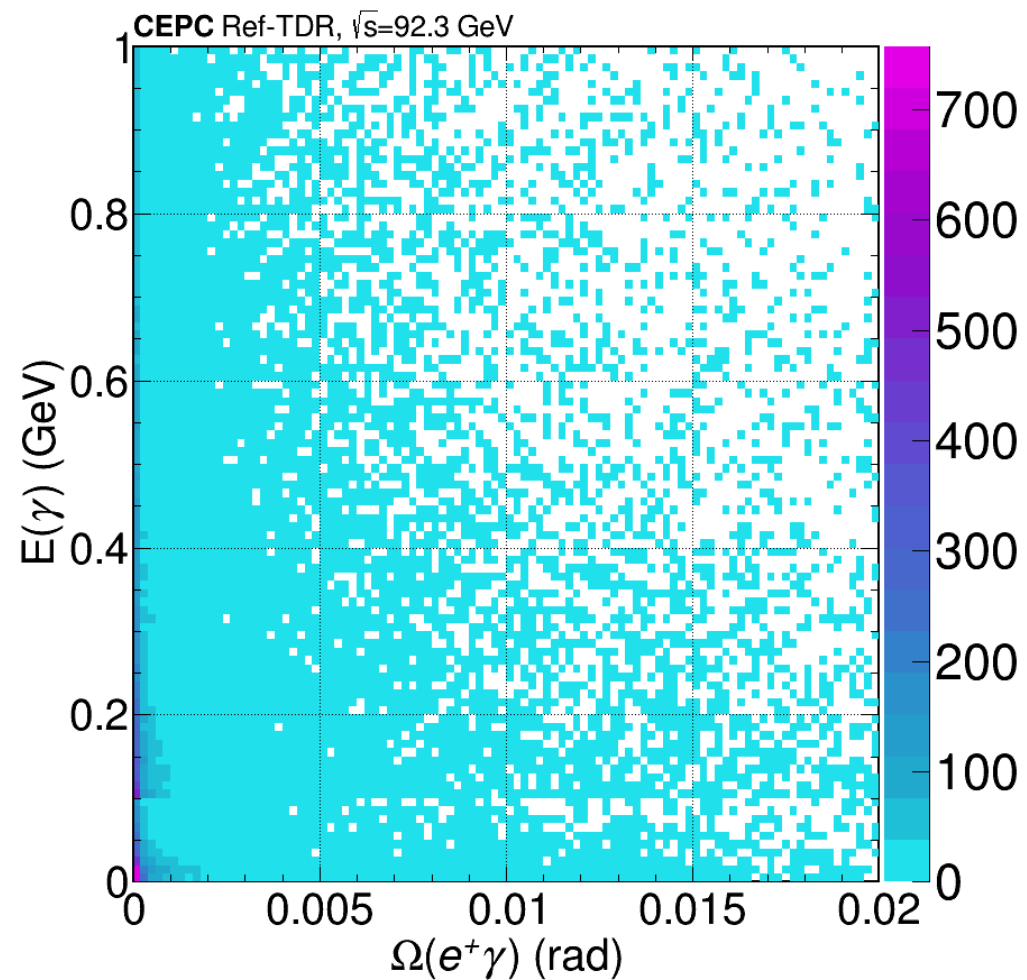
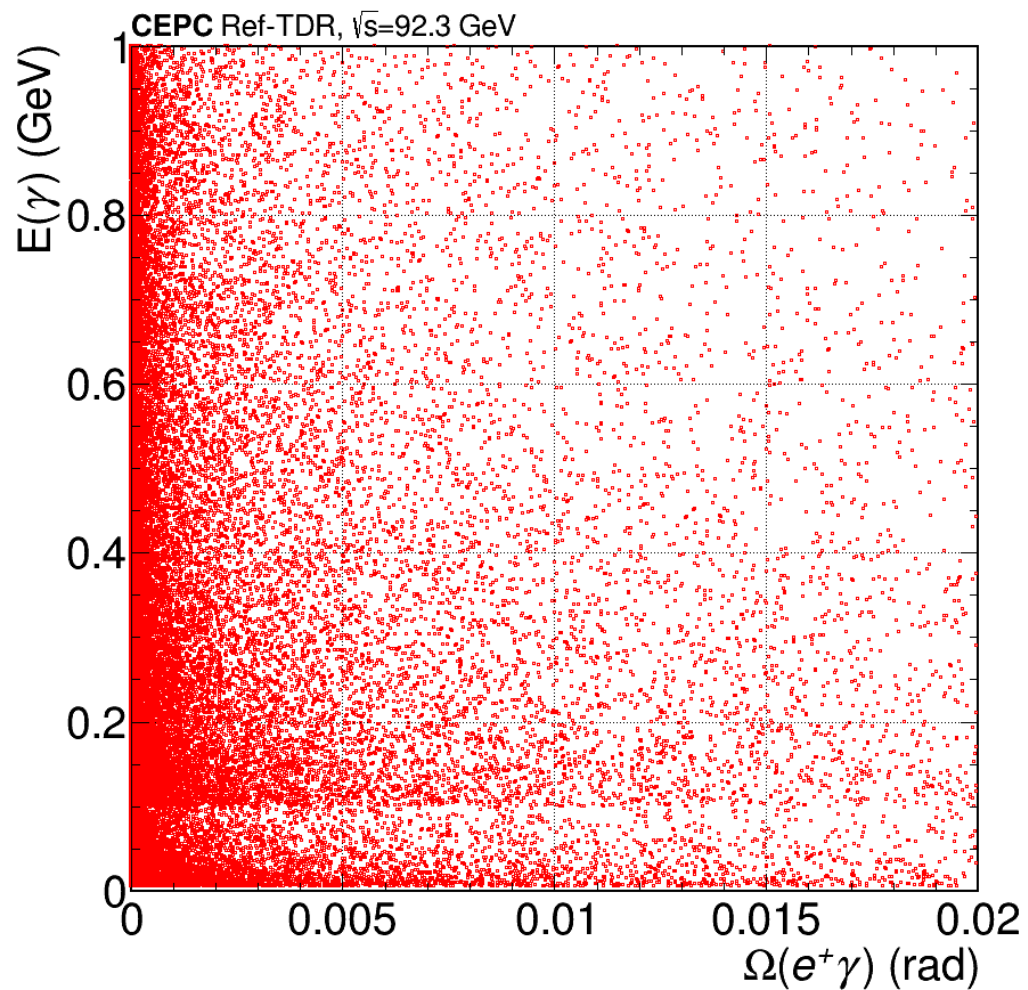
Number of points in the scatter plot (e+) (ONE) : 17691
Number of points in the scatter plot (e-) (ONE) : 17642
Number of points in the scatter plot (e+) (TWO) (FIRST) : 493
Number of points in the scatter plot (e-) (TWO) (FIEST) : 534
Number of points in the scatter plot (e+) (TWO) (SECOND) : 529
Number of points in the scatter plot (e-) (TWO) (SECOND) : 498
CMS :240.00000000000000000000[GeV]
The total number of events : 10000000.0000000000000000
The total cross section : 382.577777244586741
th1 :0.0100000000000000[Rad]
th2 :0.0800000000000000[Rad]
nevent1_cut1 : 4556688.0000000000000000 (th1 < theta < th2) && s'/s > 0.5
nevent1_cut2 : 4864364.0000000000000000 e+ or e- : r1 < r && |y| < y1 && s'/s > 0.5
nevent1_cut3 : 1136388.0000000000000000 (e-: r2 < r && |y| < y1) && cut2
nevent1_cut4 : 537859.0000000000000000 (e-: r2 < r && |y| < y1 && |y| > y2) && cut2
nevent1_cut5 : 1084565.0000000000000000 (e+: r2 < r && |y| < y1) && cut3
nevent1_cut6 : 511207.0000000000000000 (e+: r2 < r && |y| < y1 && |y| > y2) && cut4
nevent1_cut7 : 35333.0000000000000000 ONE photon can be observed.
nevent1_cut8 : 1027.0000000000000000 TWO photons can be observed.
nevent1_cut9 : 474847.0000000000000000 NO photon can be observed.
Cross Section 1 : 174.328756663708134[nb]
Cross Section 2 : 186.099756682858697[nb]
Cross Section 3 : 43.475679512742140[nb]
Cross Section 4 : 20.577290069099618[nb]
Cross Section 5 : 41.493046697727522[nb]
Cross Section 6 : 19.557643777187344[nb]
Cross Section 7 : 1.351762060338298[nb]
Cross Section 8 : 0.039290737723019[nb]
Cross Section 9 : 18.166590979126028[nb]
Beam Lab : (16.501497538082106, 0.0000000000000000, 1000.0000000000000000)

```

BHLUMI

BHLUMI

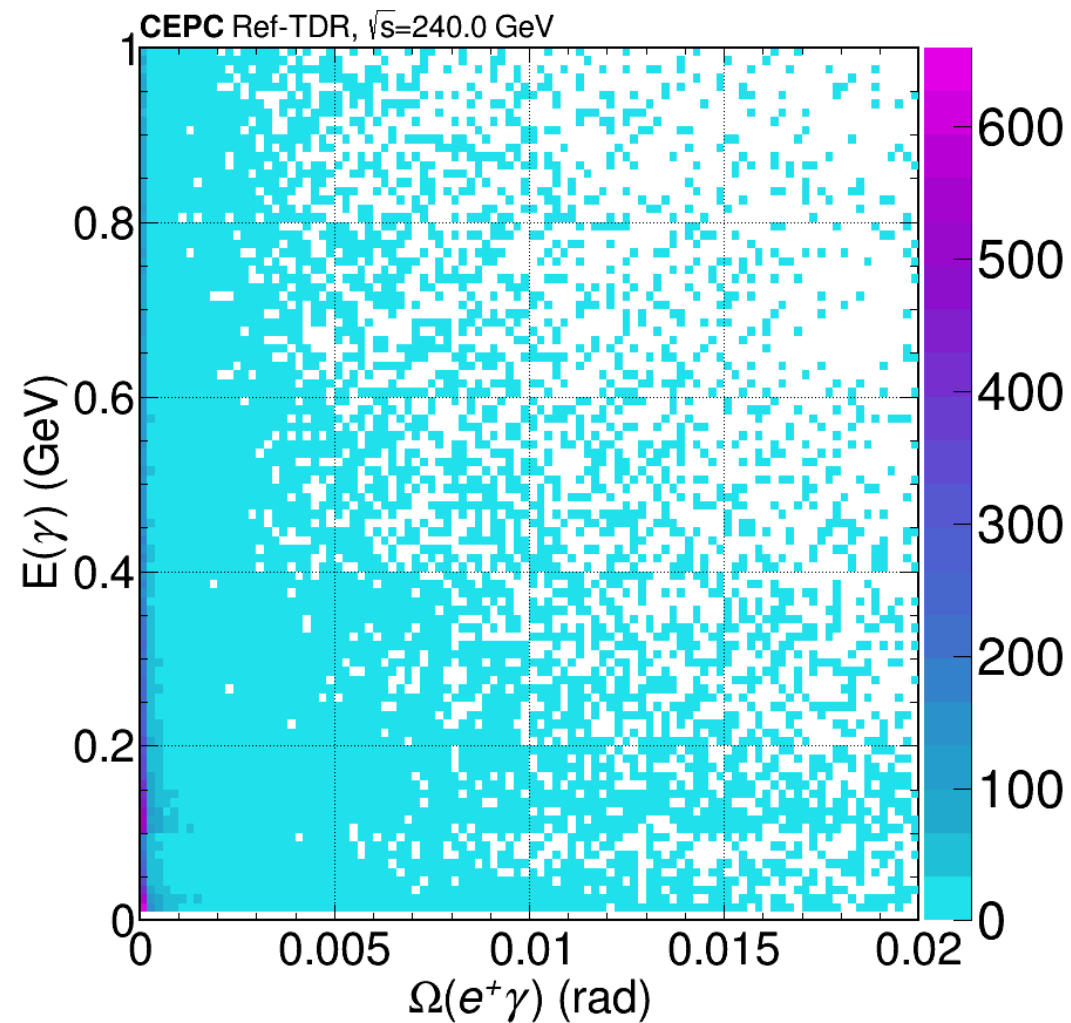
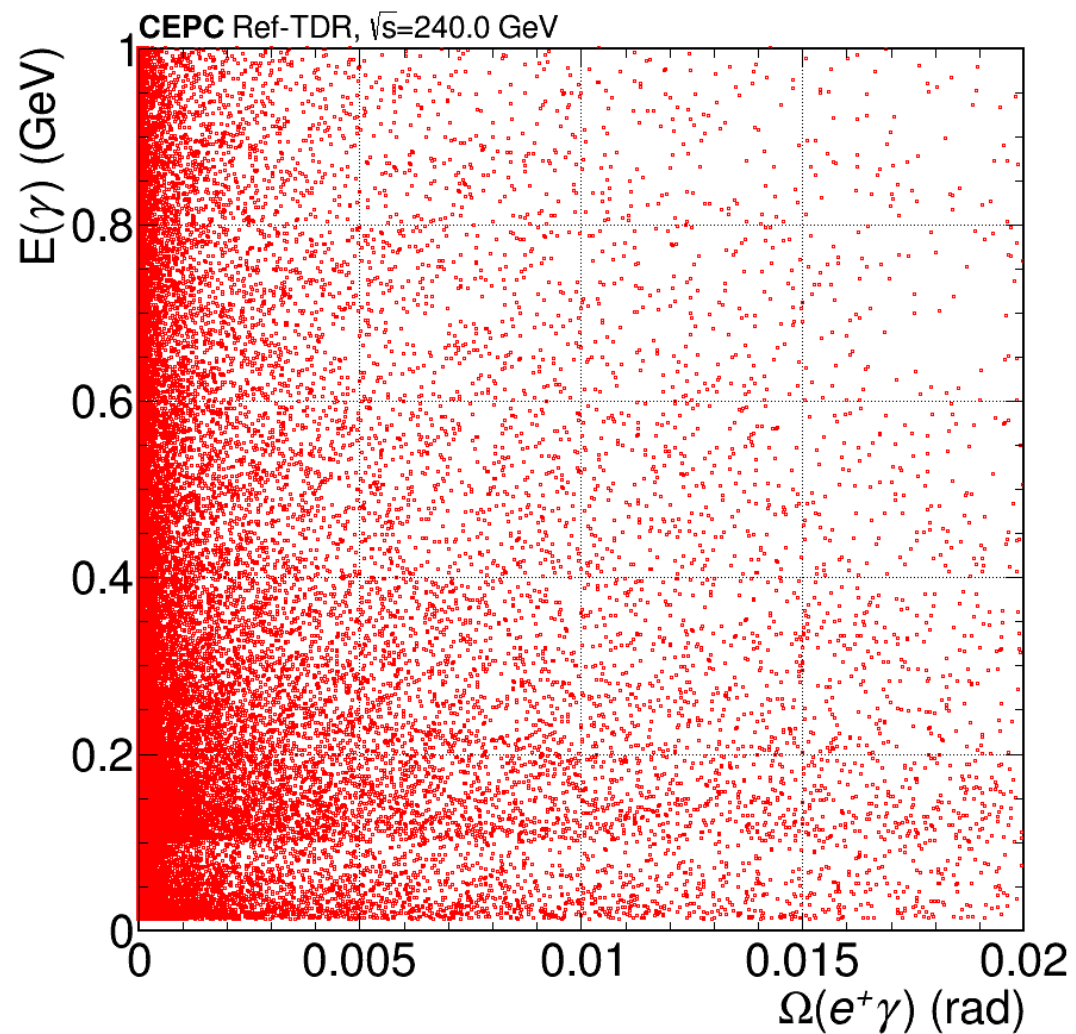
@92.3 GeV



BHLUMI

BHLUMI

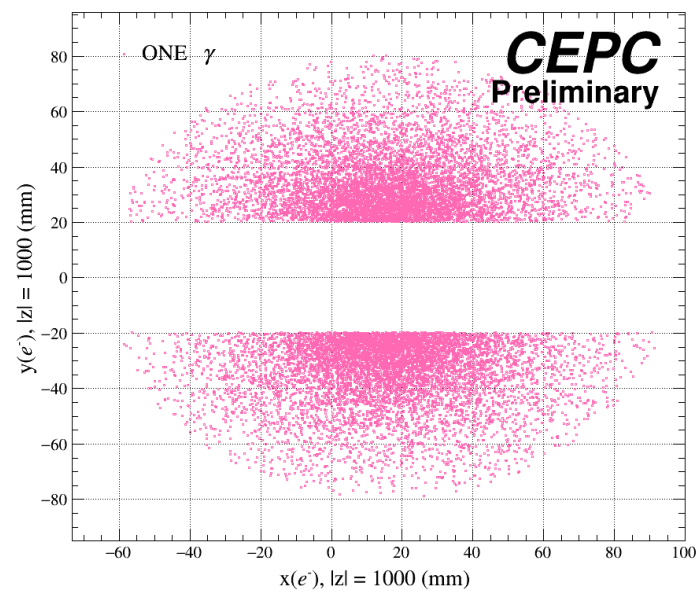
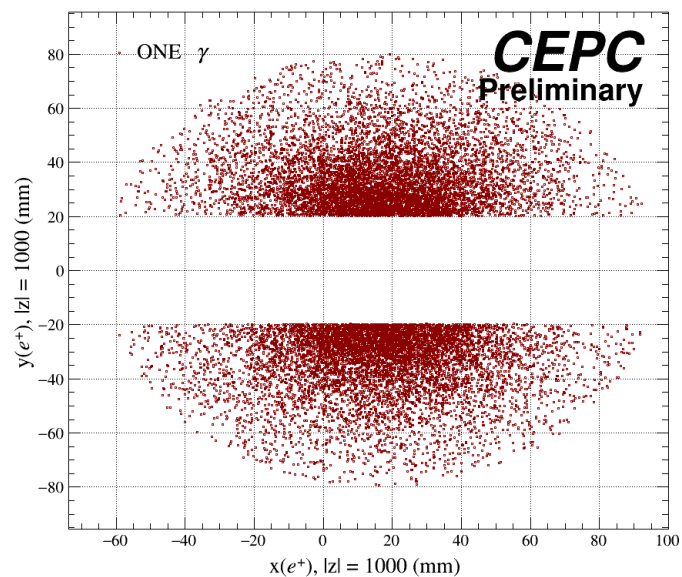
@240.0 GeV



BHLUMI

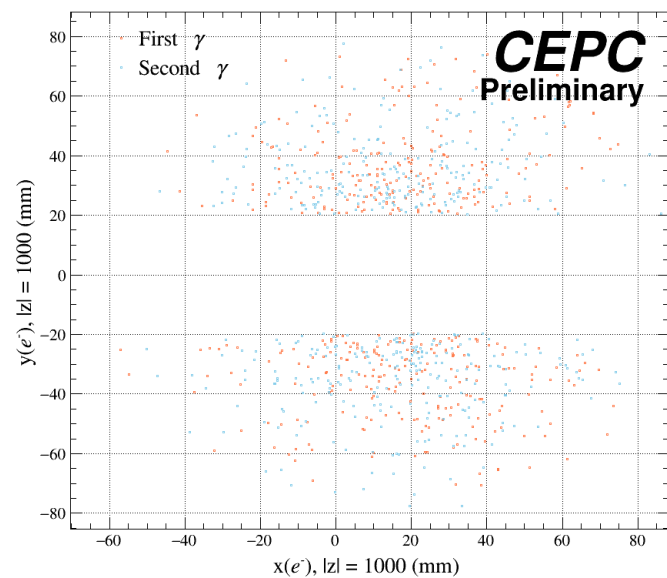
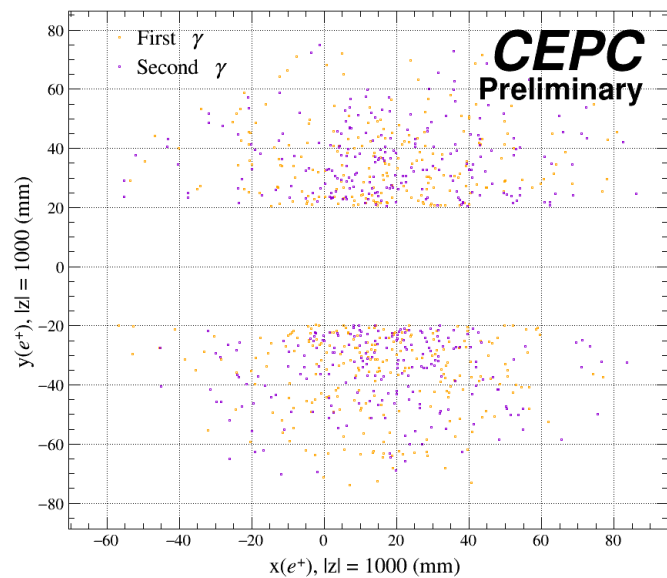
BHLUMI

@92.3 GeV



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

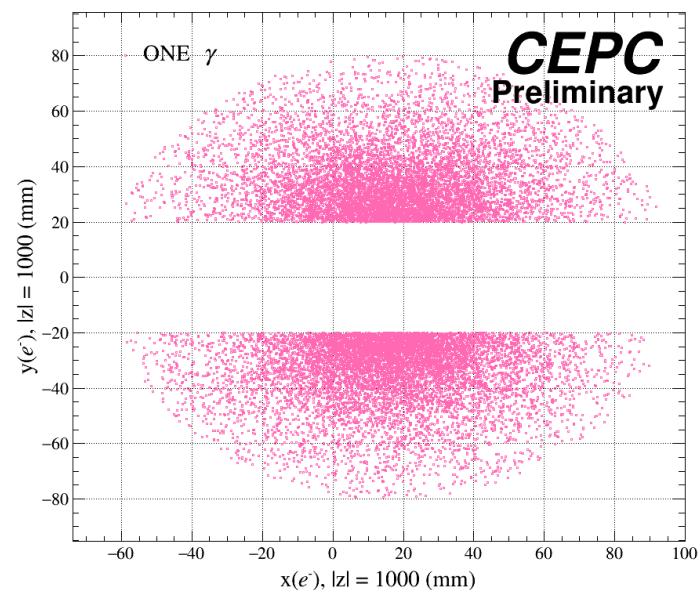
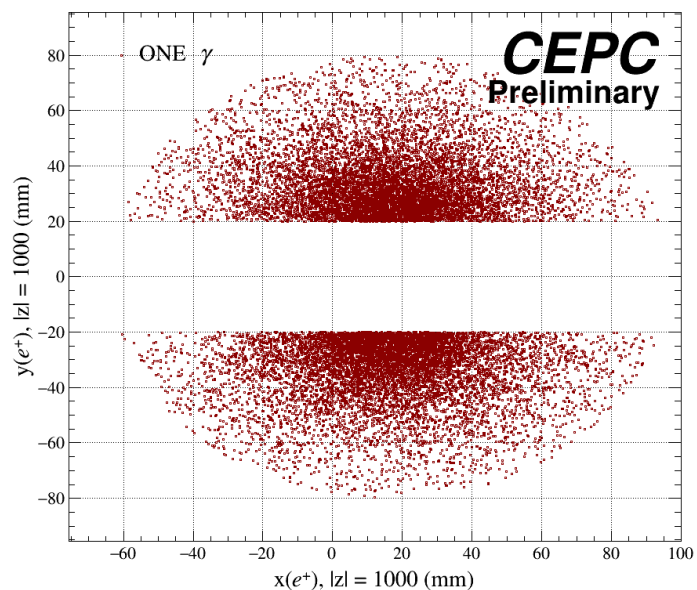
$$\theta_{\gamma e^\pm} > 0.005 \text{ rad}$$



BHLUMI

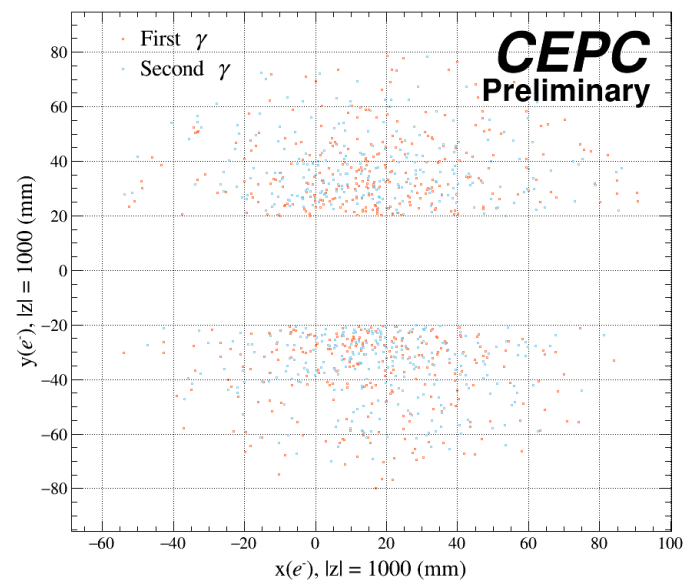
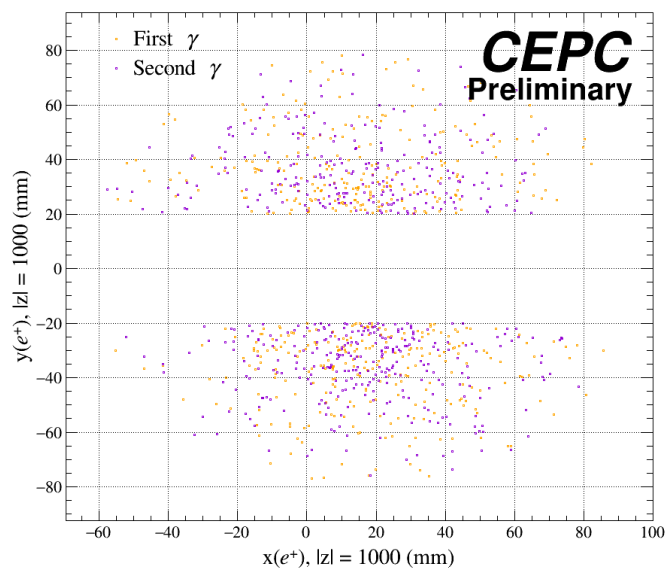
BHLUMI

@240.0 GeV



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

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



BHLUMI

BHLUMI 4.04

<https://doi.org/10.1016/j.physletb.2020.135319>

	BHLUMI(trial0)				BHLUMI(trial1)			
<i>Events</i>	1e06				1e06			
<i>CMS (GeV)</i>	92.3				92.3			
<i>Infrared cut</i>	1e-04				1e-04			
<i>thmin (rad)</i>	0.007				0.007			
<i>thmax (rad)</i>	1.571				1.571			
<i>The total cross section (nb)</i>	2560.769				2560.769			
<i>th1 (rad)</i>	0.007	0.010	0.010	0.010	0.007	0.010	0.010	0.010
<i>th2 (rad)</i>	1.571	0.785	1.571	0.100	1.571	0.785	1.571	0.100
<i>cut₁ (nb)</i>	2552.234	1256.854	1258.024	1233.843	2552.234	1256.854	1258.024	1233.843
<i>cut₂ (nb)</i>	2428.167	1191.649	1191.938	1178.932	2428.167	1191.649	1191.938	1178.932
<i>cut₃ (nb)</i>	1500.365	716.201	716.375	707.538	1500.365	716.201	716.375	707.538

Trial0 **th1 = 0.01 rad, th2 = 0.785 rad(45 degree)**

thmin = 0.7* th1, thmax = 2*th2

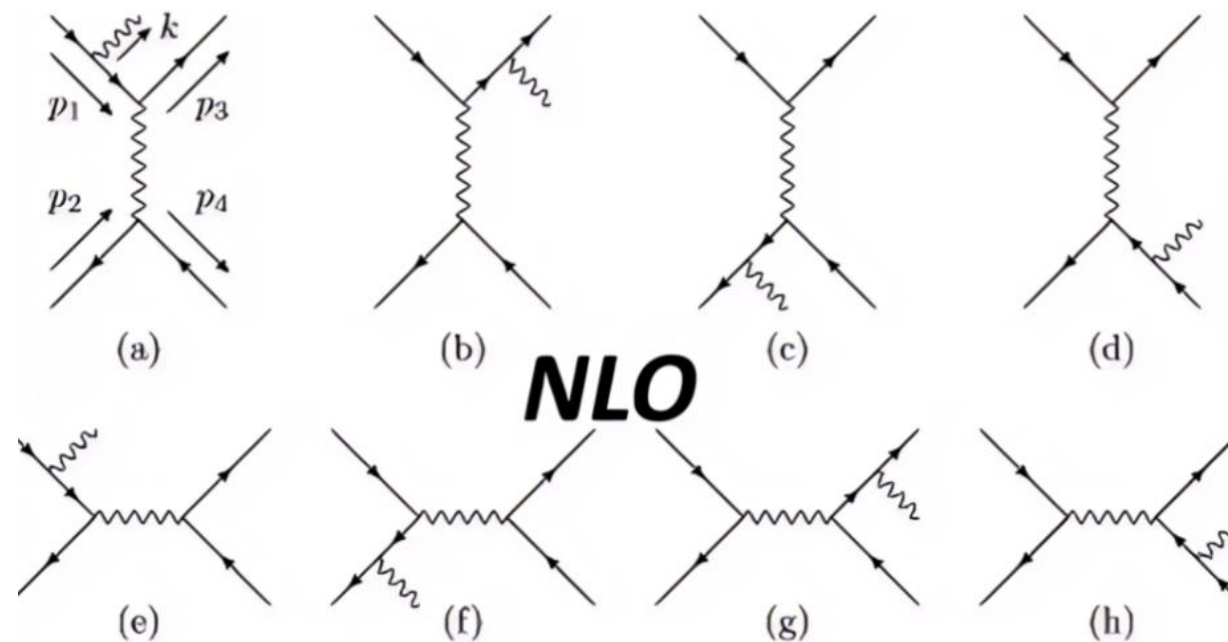
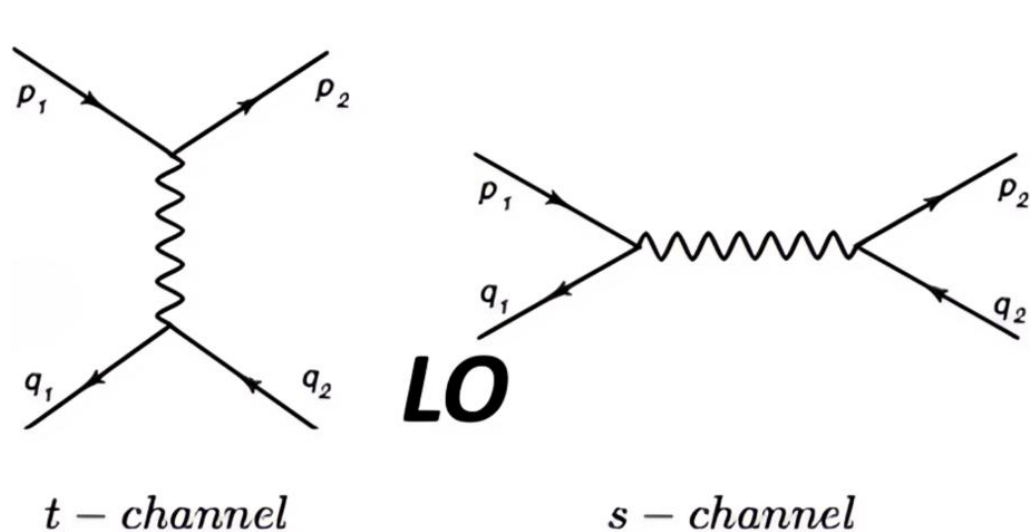
thmin = 0.007 rad, thmax = 1.57 rad(90 degree)

Trial1 **th1 = 0.007 rad, th2 = 1.57 rad(90 degree)**

thmin = 1* th1, thmax = 1*th2

thmin = 0.007 rad, thmax = 1.57 rad(90 degree)

Comparison



Renewed SANC Monte Carlo event generator
(ReneSANCe)

Chinese Physics C Vol. **48**, No. 4 (2024) 043002

<https://doi.org/10.1016/j.cpc.2020.107445>

Comparison

	BHLUMI(trial0)				ReneSANCe(trial0)				Difference			
<i>Events</i>	1e06				1e06							
<i>CMS (GeV)</i>	92.3				92.3							
<i>Infrared cut</i>	1e-04				1e-04							
<i>thmin (Rad)</i>	0.007				0.007							
<i>thmax (Rad)</i>	1.571				(1.571)							
<i>The total cross section (nb)</i>	2560.769				2560.420				-0.0136%			
<i>th1 (Rad)</i>	0.007	0.010	0.010	0.010	0.007	0.010	0.010	0.010	0.007	0.010	0.010	0.010
<i>th2 (Rad)</i>	1.571	1.571	0.785	0.100	1.571	1.571	0.785	0.100	1.571	1.571	1.571	0.100
<i>cut₁ (nb)</i>	2552.234	1258.024	1256.854	1233.843	2558.605	1311.708	1310.444	1281.188	0.25%	4.27%	4.26%	3.84%
<i>cut₂ (nb)</i>	2428.167	1191.938	1191.649	1178.932	2448.968	1255.031	1254.427	1234.409	0.86%	5.29%	5.27%	4.71%
<i>cut₃ (nb)</i>	1500.365	716.375	716.201	707.538	1290.861	655.736	655.178	639.060	-13.96%	-8.465%	-8.52%	-9.68%

Trial0(BHLUMI) **th1 = 0.01 rad, th2 = 0.785 rad(45 degree)**

thmin = 0.7* th1, thmax = 2*th2

thmin = 0.007 rad, thmax = 1.57 rad(90 degree)

Comparison

	BHLUMI(trial2)				ReneSANCe(trial2)				Difference			
<i>Events</i>	1e06				1e06							
<i>CMS (GeV)</i>	92.3				92.3							
<i>Infrared cut</i>	1e-04				1e-04							
<i>thmin (Rad)</i>	0.025				0.025							
<i>thmax (Rad)</i>	1.571				(1.571)							
<i>The total cross section (nb)</i>	203.253				203.671				-0.206%			
<i>th1 (Rad)</i>	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
<i>th2 (Rad)</i>	1.571	0.785	0.100	0.080	1.571	0.785	0.100	0.080	1.571	0.785	0.100	0.080
<i>cut₁ (nb)</i>	202.388	201.797	184.863	176.465	202.584	201.724	183.122	173.889	0.0968%	-0.0362%	-0.942%	-1.46%
<i>cut₂ (nb)</i>	190.675	190.427	177.904	170.622	194.713	194.102	178.487	169.987	2.11%	1.93%	0.328%	-0.372%
<i>cut₃ (nb)</i>	107.036	106.890	99.351	95.148	109.368	108.877	97.665	92.062	2.18%	1.86%	-1.70%	-3.24%

Trial2(BHLUMI) th1 = 0.025 rad, th2 = 1.57 rad(90 degree)

thmin = 1* th1, thmax = 1*th2

2025/7/31

thmin = 0.025 rad, thmax = 1.57 rad(90 degree)

Comparison

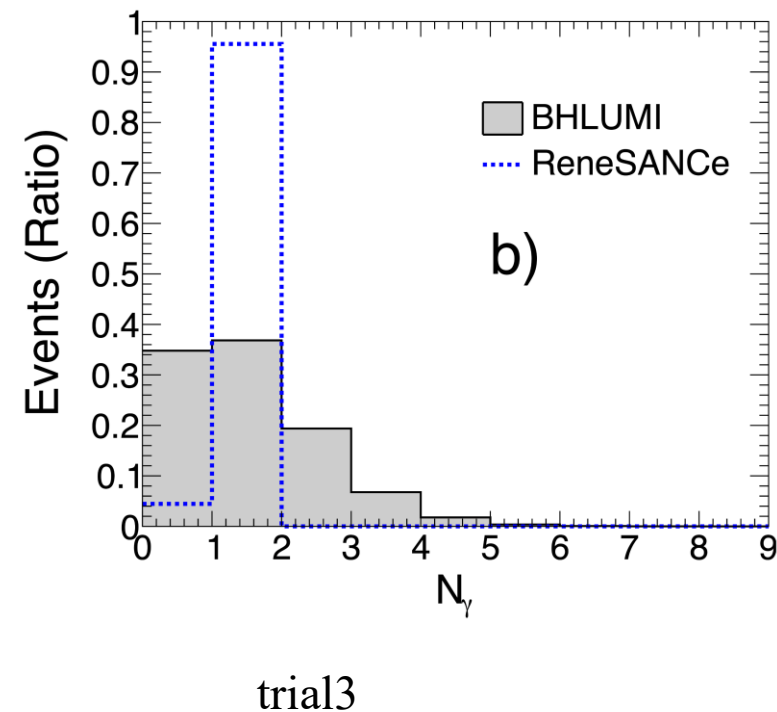
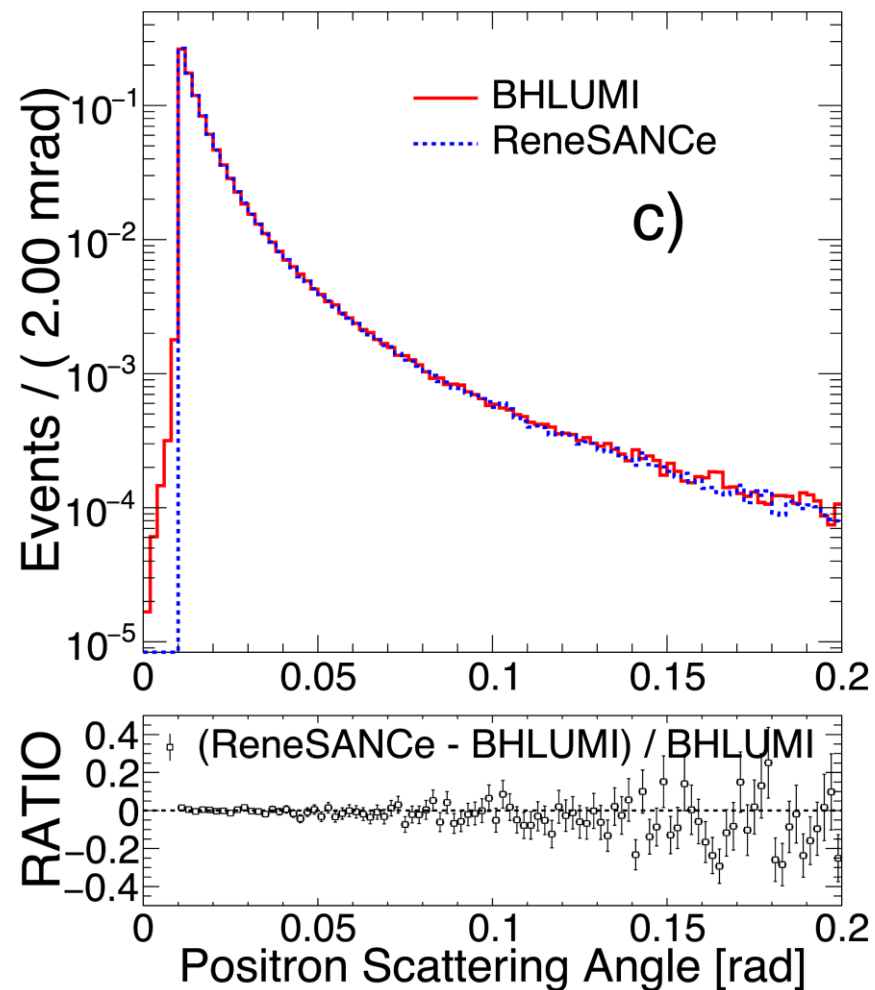
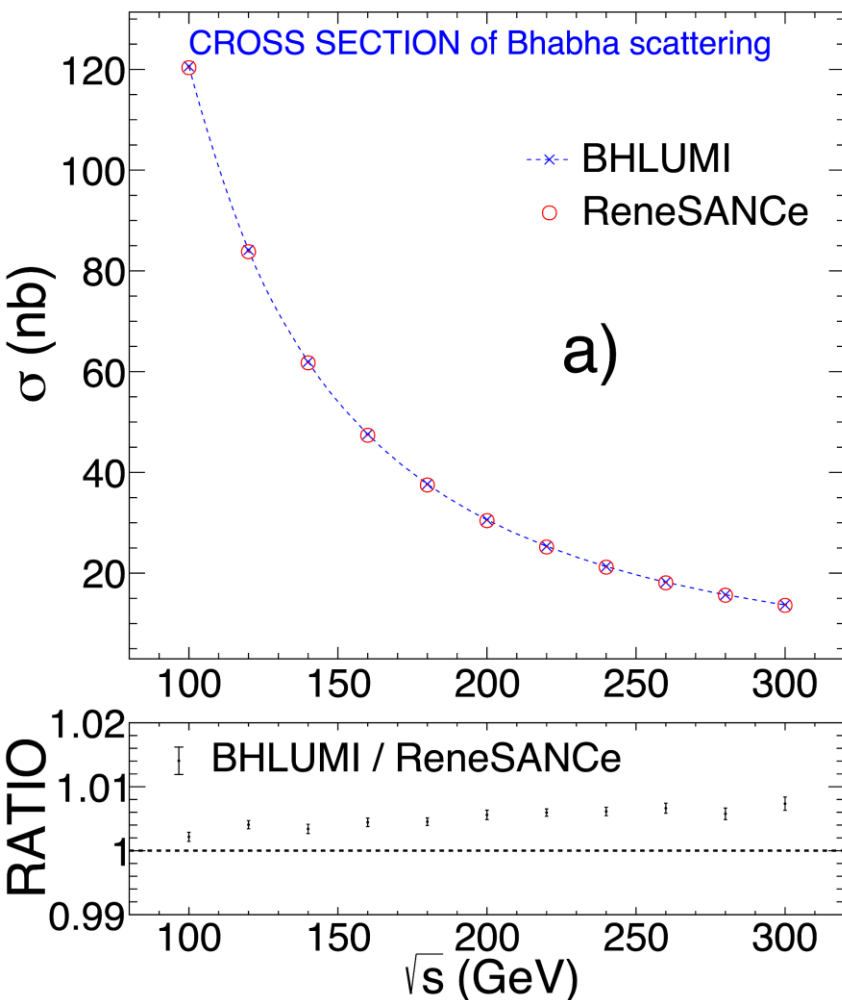
	BHLUMI(trial3)				ReneSANCe(trial3)				Difference			
<i>Events</i>	1e06				1e06							
<i>CMS (GeV)</i>	92.3				92.3							
<i>Infrared cut</i>	1e-04				1e-04							
<i>thmin (Rad)</i>	0.010				0.010							
<i>thmax (Rad)</i>	1.571				(1.571)							
<i>The total cross section (nb)</i>	1259.280				1259.361				-0.00643%			
<i>th1 (Rad)</i>	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
<i>th2 (Rad)</i>	1.571	0.785	0.100	0.080	1.571	0.785	0.100	0.080	1.571	0.785	0.100	0.080
<i>cut₁ (nb)</i>	1254.889	1253.802	1231.169	1221.183	1257.831	1256.441	1228.925	1216.130	0.234%	0.210%	-0.182%	-0.414%
<i>cut₂ (nb)</i>	1190.680	1190.410	1177.849	1170.784	1203.834	1203.078	1184.031	1173.697	1.105%	1.064%	-0.525%	0.249%
<i>cut₃ (nb)</i>	716.413	716.243	707.637	702.840	629.589	628.934	613.512	605.743	-12.11%	-12.19%	-13.30%	-13.81%

Trial3(BHLUMI) th1 = 0.010 rad, th2 = 1.57 rad(90 degree)

thmin = 1* th1, thmax = 1*th2

thmin = 0.025 rad, thmax = 1.57 rad(90 degree)

Comparison



thmin = 0.7* th1, thmax = 2*th2

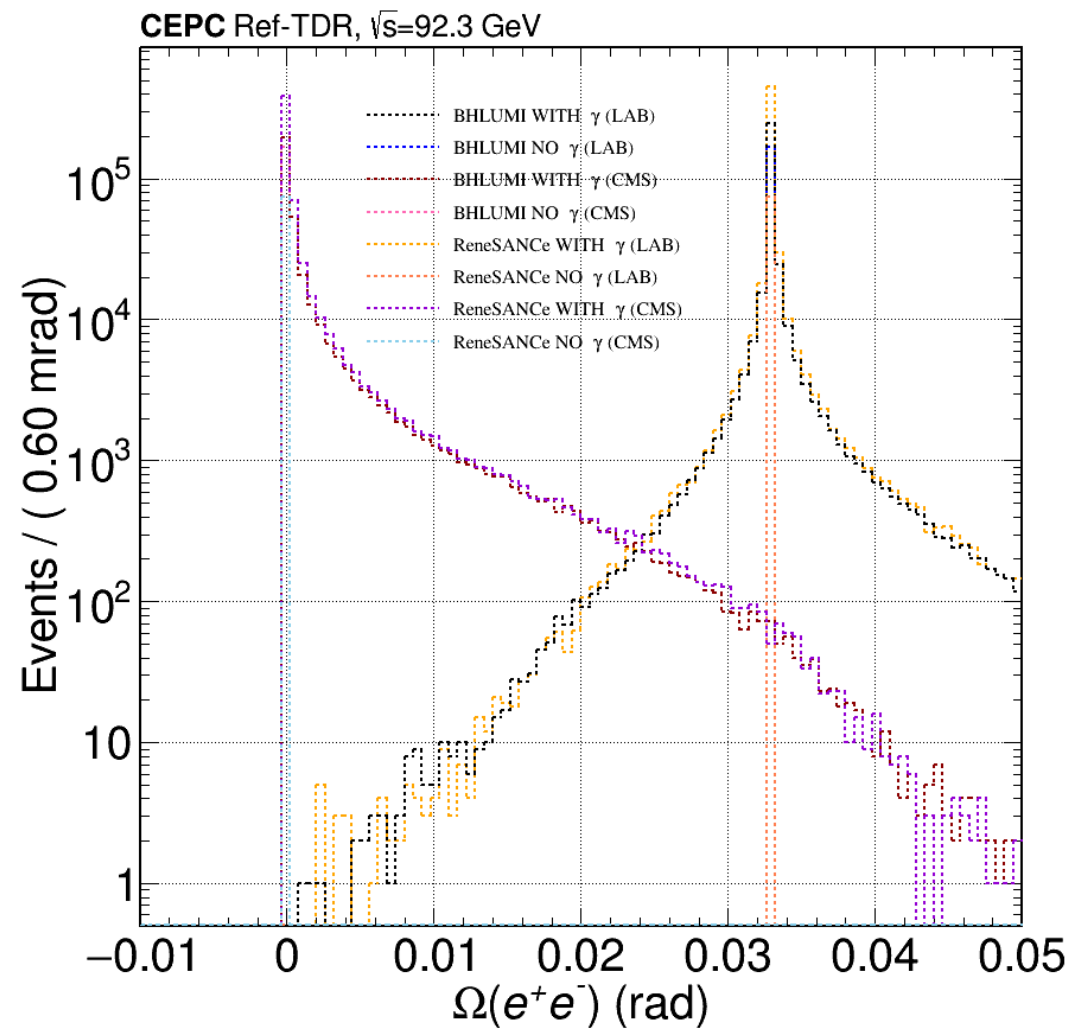
2025/7/31

Longitudinal polarization of initial particles:

lamep : 0.6 # e^+ polarization

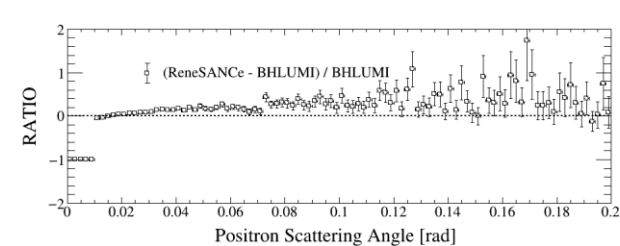
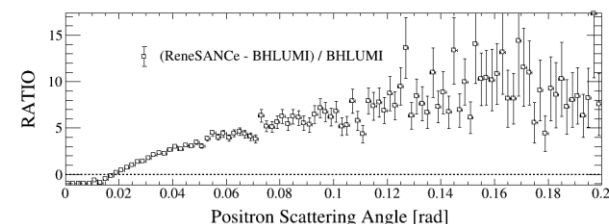
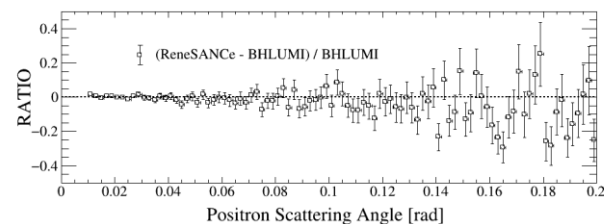
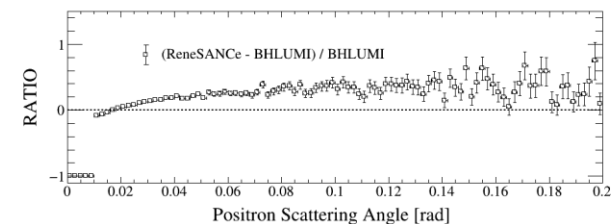
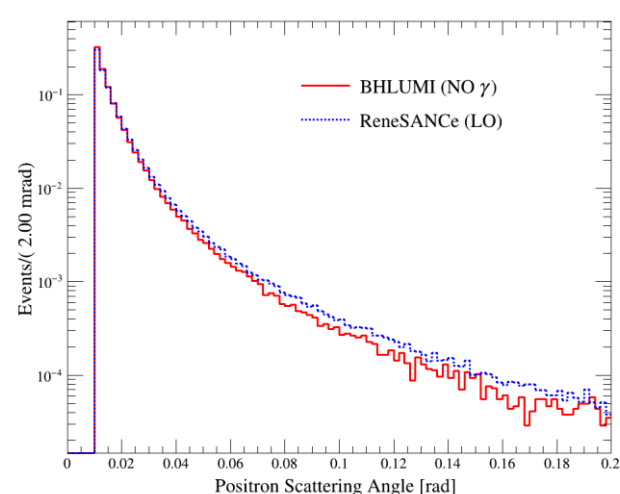
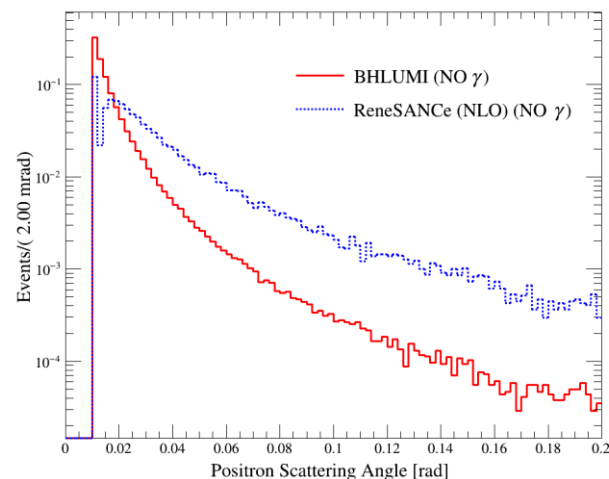
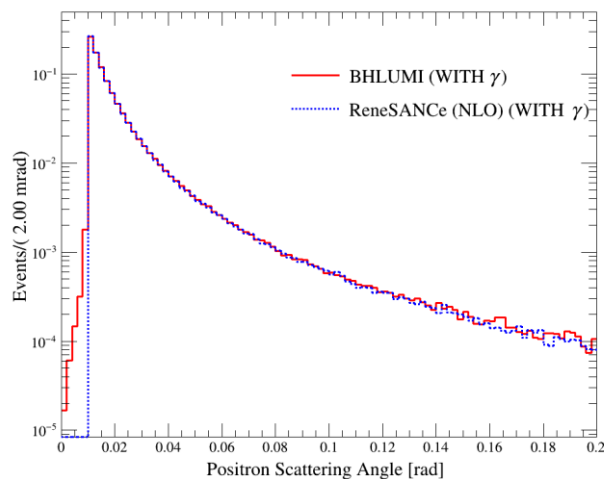
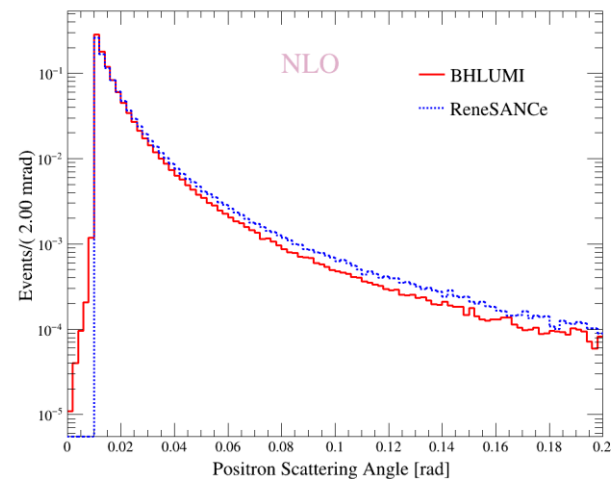
lamem : -0.8 # e^- polarization

Comparison



Comparison

Trial3 : $\theta_{\min} = 0.01\text{rad}$, $\theta_{\max} = 1.571\text{rad}$, $\sigma \approx 1259\text{ nb}$, $\Delta\sigma = -0.00643\%$



BHLUMI : $1\text{e}+06$
ReneSANCe : $1\text{e}+06$

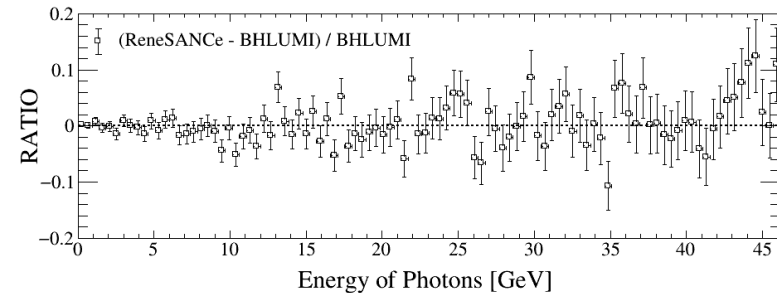
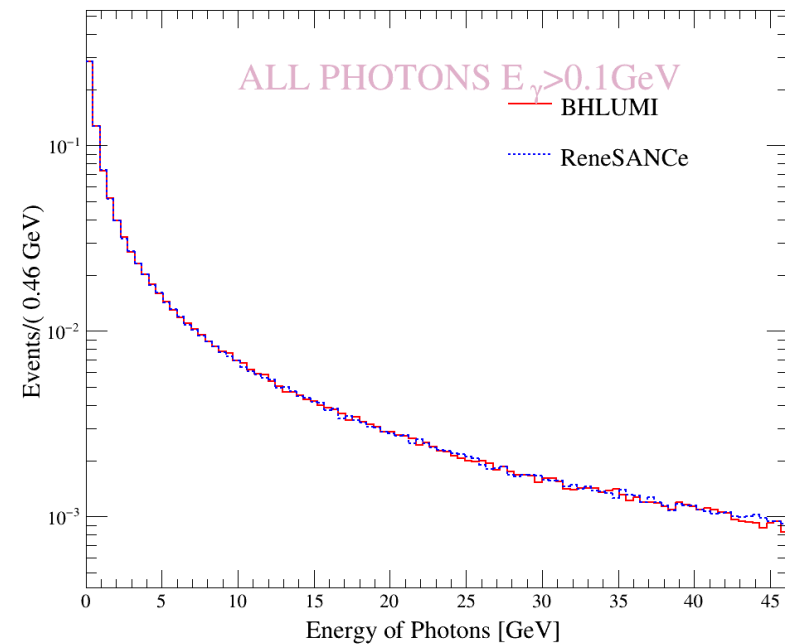
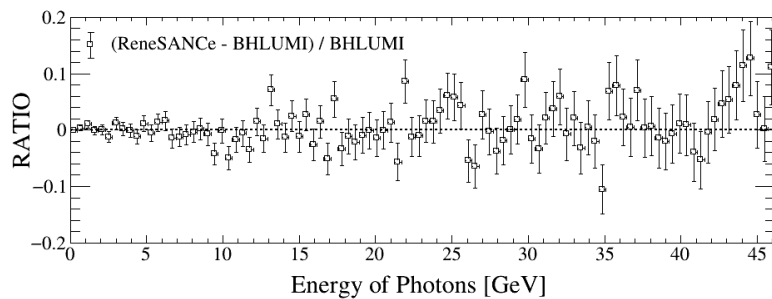
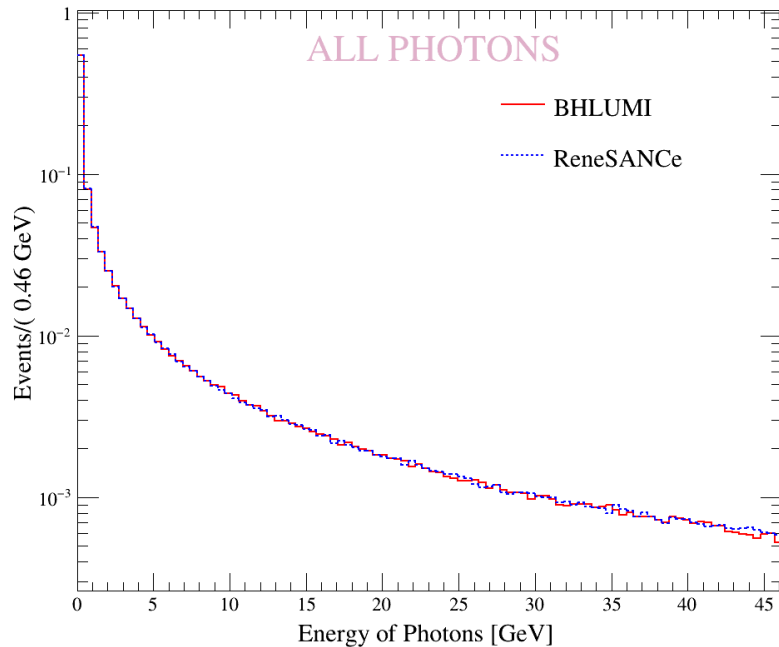
BHLUMI (NLO)(with photons) : 657471
ReneSANCe (NLO) (with photons) : 953210

BHLUMI (NLO)(no photon) : 342529
ReneSANCe (NLO)(no photon) : 46790

BHLUMI (NLO)(no photon) : 342529
ReneSANCe (LO) : $1\text{e}+06$

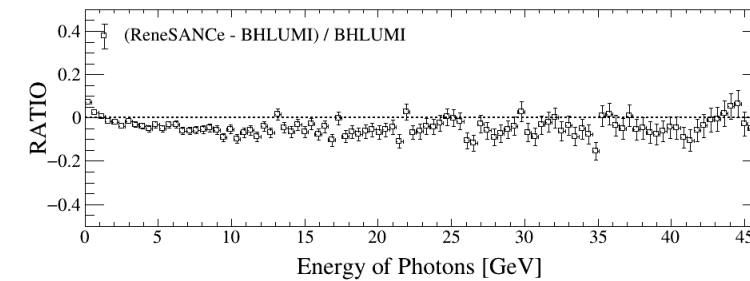
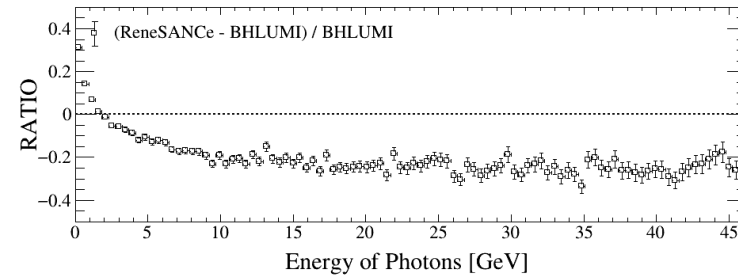
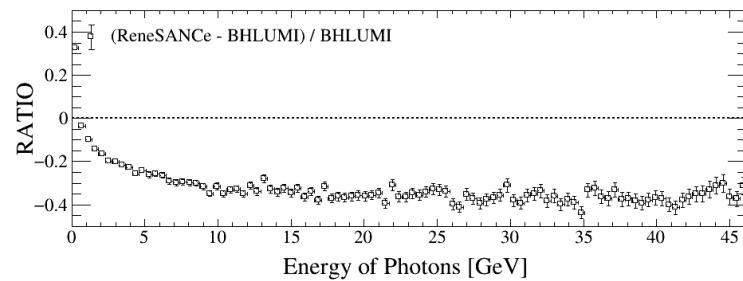
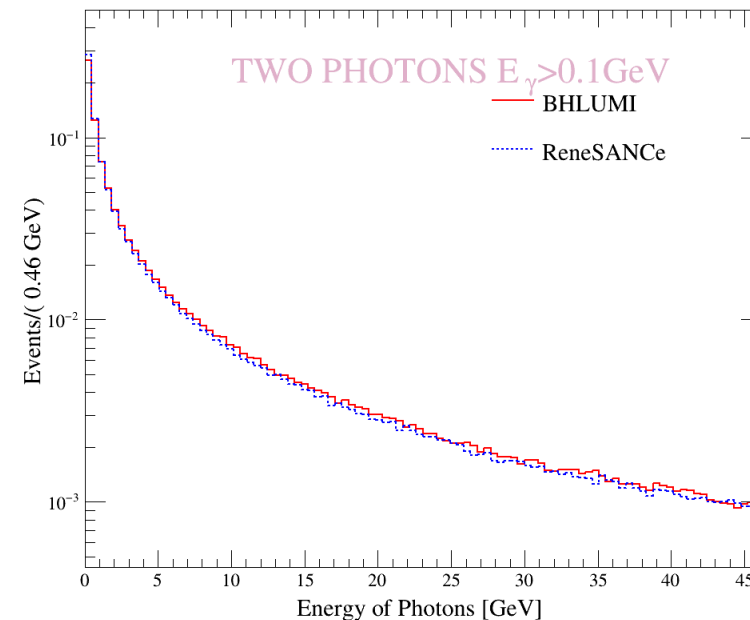
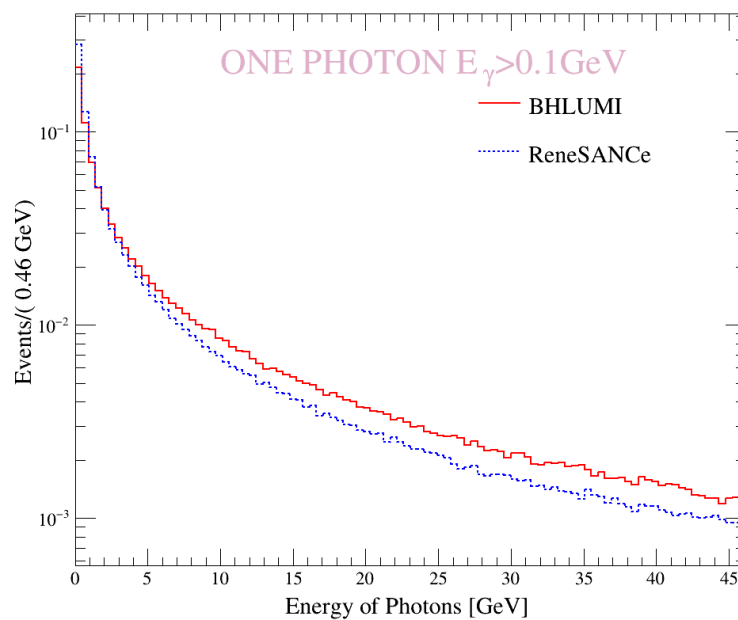
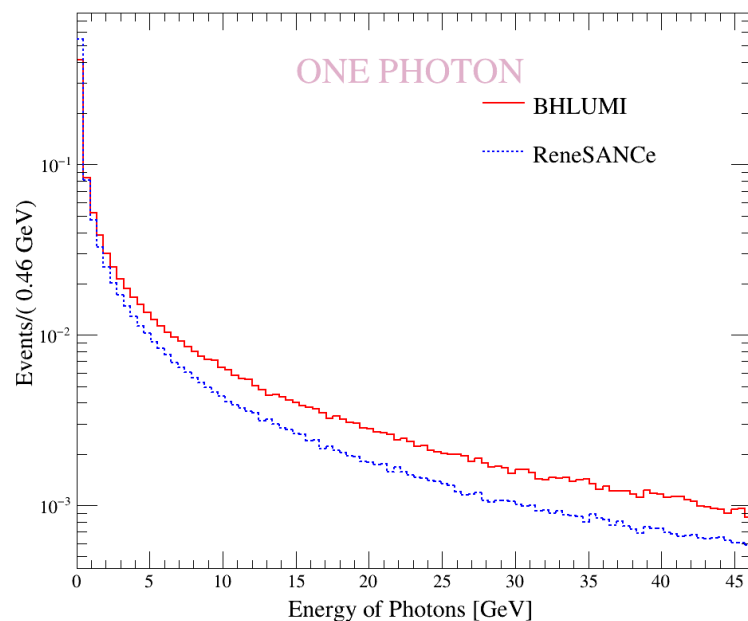
Comparison

Trial3 : $\theta_{\min} = 0.01\text{rad}$, $\theta_{\max} = 1.571\text{rad}$, $\sigma \approx 1259\text{ nb}$, $\Delta\sigma = -0.00643\%$



Comparison

Trial3 : $\theta_{\min} = 0.01\text{rad}$, $\theta_{\max} = 1.571\text{rad}$, $\sigma \approx 1259\text{ nb}$, $\Delta\sigma = -0.00643\%$



2025/7/31 BHLUMI : 657471
ReneSANCe : 953210

BHLUMI : 494729
ReneSANCe : 607355

BHLUMI : 642805
ReneSANCe : 607355

Comparison

@92.3 GeV

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

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

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

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

Comparison

@92.3 GeV

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

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

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

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