Outline

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Selection Criteria

- $N_{\text{good}} = 2$, $Q_{\text{tot}} = 0$ ($|V_r| < 1\ cm, |V_z| < 10\ cm, |\cos\theta| < 0.8$)
- $0.2\ E_{beam} < P_{\ell^{\pm}} < 1.1 E_{beam}$
- Back-to-back, $\left|\Delta\theta_{\ell^{\pm}}\right| = |\theta_1 + \theta_2 - 180^o| < 10^o, \left|\Delta\phi_{\ell^{\pm}}\right| = \left||\phi_1 - \phi_2| - 180^o\right| < 5^o$

nGood requirement

It is required that there are at least two good charged tracks in one event, and satisfy the cut on $\cos\theta$ and momentum. At the same time, it is necessary to ensure that the two tracks with the largest momentum are satisfying $|\Delta\theta_{\ell^\pm}| < 10^o$, $|\Delta\phi_{\ell^\pm}| < 5^o$ to measure the control sample is pure.

process	number	process	number
collision	9458006	EEeta	12
bhabha	7899554	EEetap	171
digam	14781	EEkk	3887
dimu	341326	EEpipi	6684
ditau	140326	EEuu	2627
EEee	32847	qqbar	875512

The table shows the number of events without the $|\Delta\theta_{\ell^\pm}|$ and $|\Delta\phi_{\ell^\pm}|$ cut conditions, where the background contamination reaches 11.4%, indicating that the control sample is not sufficiently pure.

nGood requirement

process	number	process	number
collision	7589578	EEeta	1
bhabha	7252093	EEetap	4
digam	286	EEkk	391
dimu	293484	EEpipi	636
ditau	1916	EEuu	298
EEee	4888	qqbar	17002

process	number	process	number
collision	7553823	EEeta	1
bhabha	7252093	EEetap	3
digam	108	EEkk	387
dimu	293424	EEpipi	629
ditau	1418	EEuu	279
EEee	4888	qqbar	7166

The first table shows the number of events with at least two good charged tracks in one event, where the background contamination reaches 0.3%, indicating that the control sample is sufficiently pure. The second table shows the number of events with two good charged tracks in one event, we can calculate the efficiency of both data and MC.

ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1$
0.9984	0.9987	0.03%

$\Delta\theta$ cut range

It is required that there are two good charged tracks in one event, and satisfy the cut on momentum, $\cos\theta$ and $\Delta\phi$.

$(|\Delta\theta_{\ell^{\pm}}| = |\theta_1 + \theta_2 - 180^o| < 20^o)$

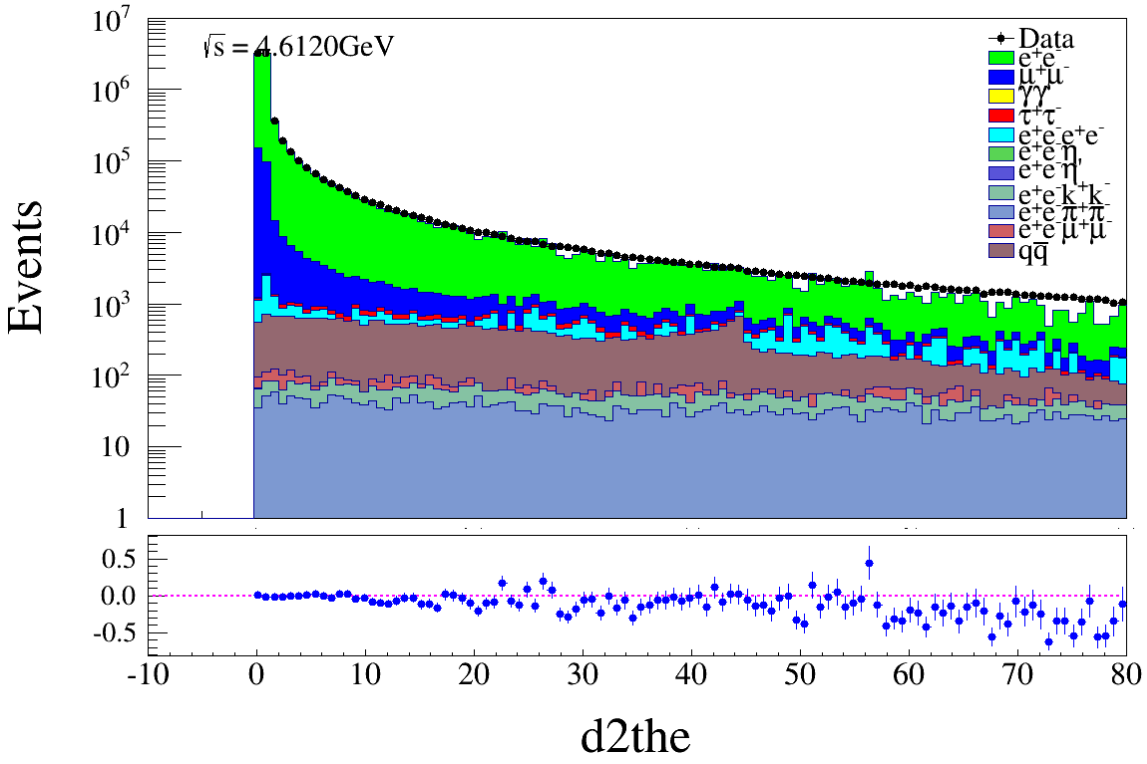
process	number	process	number
collision	7782484	EEeta	2
bhabha	7434008	EEetap	3
digam	108	EEkk	738
dimu	304648	EEpipi	1166
ditau	2656	EEuu	529
EEee	6256	qqbar	12856

$(|\Delta\theta_{\ell^{\pm}}| = |\theta_1 + \theta_2 - 180^o| < 10^o)$

process	number	process	number
collision	7553823	EEeta	1
bhabha	7242042	EEetap	3
digam	108	EEkk	387
dimu	293424	EEpipi	629
ditau	1418	EEuu	279
EEee	4790	qqbar	7166

Background ratio	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1$
0.31%	0.9718	0.9737	0.2%

$\Delta\theta$ cut range



$\Delta\phi$ cut range

It is required that there are two good charged tracks in one event, and satisfy the cut on momentum, $\cos\theta$ and $\Delta\theta$.

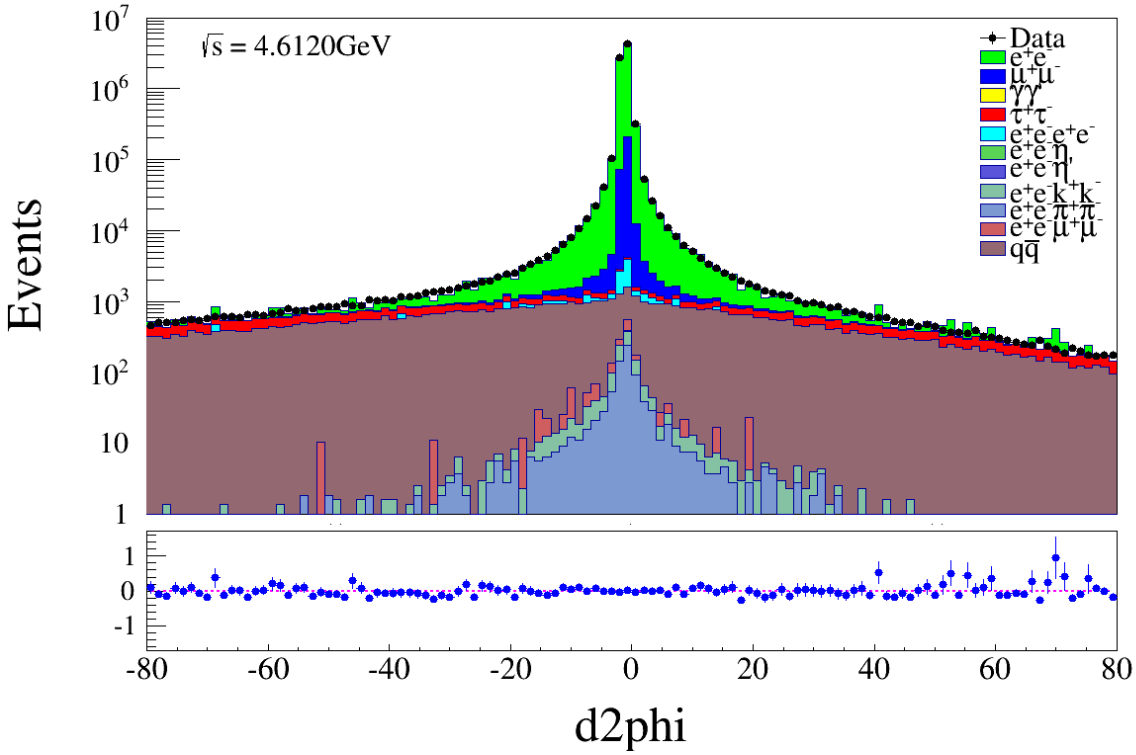
$$\left|\Delta\phi_{\ell^{\pm}}\right| = \left||\phi_1 - \phi_2| - 180^o\right| < 5^o$$

process	number	process	number
collision	7798789	EEeta	1
bhabha	7377664	EEetap	4
digam	890	EEkk	574
dimu	301210	EEpipi	906
ditau	24436	EEuu	481
EEee	6256	qqbar	81124

process	number	process	number
collision	7553823	EEeta	1
bhabha	7242042	EEetap	3
digam	108	EEkk	387
dimu	293424	EEpipi	629
ditau	1418	EEuu	279
EEee	4790	qqbar	7166

Background ratio	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1$
1.5%	0.9811	0.9813	-0.02%

$\Delta\phi$ cut range



$\cos\theta$ cut range

It is required that there are two good charged tracks in one event, and satisfy the cut on momentum, $\Delta\theta$ and $\Delta\phi$.

$(|\cos\theta| < 0.82)$

process	number	process	number
collision	7984929	EEeta	1
bhabha	7667382	EEetap	2
digam	108	EEkk	393
dimu	297875	EEpipi	640
ditau	1393	EEuu	288
EEee	5376	qqbar	6265

$(|\cos\theta| < 0.8)$

process	number	process	number
collision	7551878	EEeta	1
bhabha	7241192	EEetap	2
digam	106	EEkk	384
dimu	293414	EEpipi	625
ditau	1368	EEuu	279
EEee	4790	qqbar	6125

Background ratio	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1$	total
0.18%	0.9457	0.9459	0.02%	0.04%

Momentum cut range

It is required that there are two good charged tracks in one event, and satisfy the cut on $\cos\theta$, $\Delta\theta$ and $\Delta\phi$.

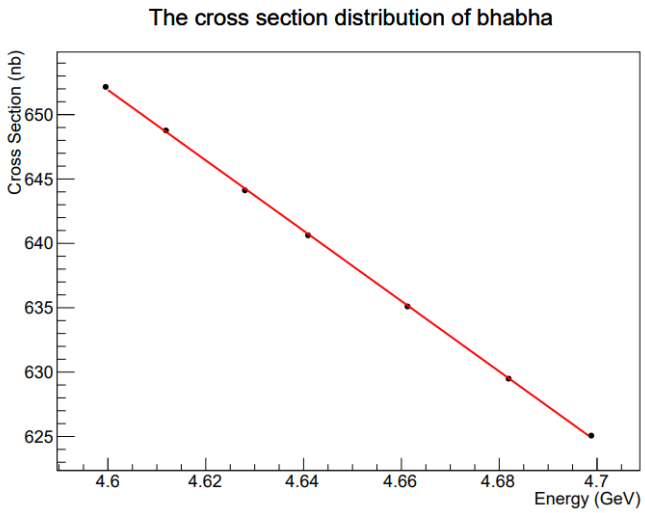
$$(0.2\,E_{beam} < P_{\ell^{\pm}} < 1.1E_{beam})$$

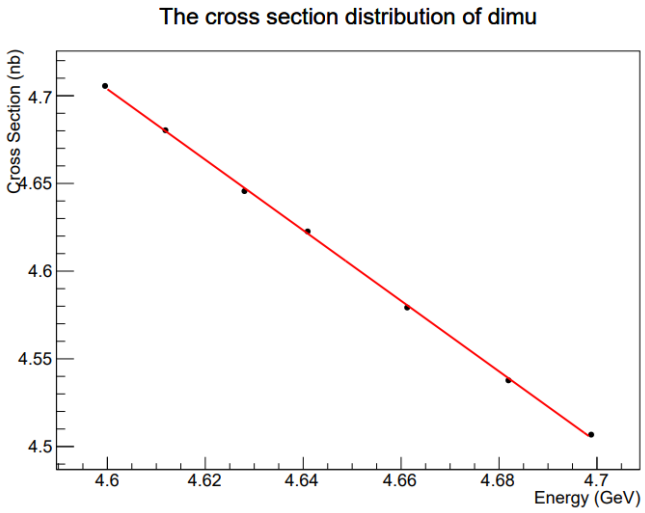
process	number	process	number
collision	7580538	EEeta	1
bhabha	7282884	EEetap	19
digam	76	EEkk	417
dimu	293149	EEpipi	755
ditau	1531	EEuu	375
EEee	6256	qqbar	2773

process	number	process	number
collision	7507239	EEeta	1
bhabha	7209127	EEetap	2
digam	76	EEkk	384
dimu	292811	EEpipi	628
ditau	1118	EEuu	269
EEee	4399	qqbar	2145

Background ratio	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1$	total
0.16%	0.9907	0.9902	-0.05%	0.1%

Cross section





$\sigma^{obs}_{e^+e^-\to e^+e^-} = -273.185 * E_{cm} + 1908.56$

$\sigma^{obs}_{e^+e^-\to \mu^+\mu^-} = -2.01132 * E_{cm} + 13.9558$

4.61186 GeV	$\sigma^{obs}_{e^+e^-\to e^+e^-}$ (nb)	$\sigma^{obs}_{e^+e^-\to \mu^+\mu^-}$ (nb)	Lum.(pb^{-1})	Sys.
old	648.7677	4.6803	103.6992	0.05%
new	648.3958	4.6779	103.7553	

MC statistic

The systematic uncertainty of Monte Carlo statistics is estimated by:

$$\frac{\sqrt{(1-\epsilon)*\epsilon}}{\sqrt{N}}$$

where N is the number of MC events and ϵ is the detection efficiency.

	N	ϵ	$\delta\epsilon$
bhabha	950000	0.1077	0.0003
dimu	1000000	0.6049	0.0005

Lum.(pb^{-1})(Nol)	Lum.(pb^{-1})	Lum.(pb^{-1})	Lum.(pb^{-1})	Lum.(pb^{-1})	Sys.
103.6992	103.4332	103.4398	103.9884	103.9951	0.3%

Systematic uncertainties in the tracking efficiencies

- There is at least one good charged track; N_{Good}>= 1;
  - $|V_{xy}|$ < 1 cm;
  - $|V_z|$ < 10 cm;
  - |cos θ| <0.93;
- For the charged track
  - The momentum: p > 1.8 GeV/c;
  - Deposited energy in EMC: E_{EMC}>1.0 GeV, E_{EMC}/p > 0.8 and E_{EMC} /p < 1.2.
- photon selection
  - E_γ > 0.025 GeV for |cosθ| < 0.80 (Barrel part of EMC);
  - E_γ > 0.050 GeV for 0.86 < |cosθ| < 0.92 (EndCap part of EMC);
  - 0 =< TDC <= 14;
  - $\Delta\theta_{\gamma-C}$> 10° .
- At least one photon is reconstructed in EMC;
  - E_γ > 0.1 GeV;
  - The angle between photon and the missing charged track should be less than 20°.

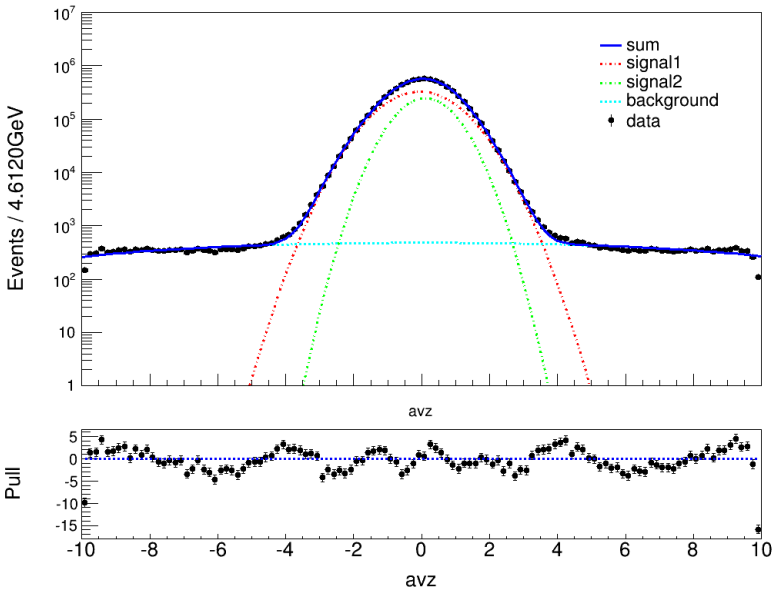
Systematic uncertainties in the tracking efficiencies

- Assuming one charged track ($e^{\pm}$) is missing, the kinematic fit is performed on γ plus the detected $e^{\mp}$ combinations, with $\chi^2 < 5$.
- Then we search for the other one charged track originating from the vertex region defined by:
  - $|V_{xy}| < 1$ cm;
  - $|V_z| < 10$ cm;
  - $|\cos\theta| < 0.93$;
- If we can find one charged track, we call it as the "found" e +/−;
  otherwise, we call it as "un-found" e +/−.
- The tracking efficiency of electron for data/MC is determined by:

$$\epsilon_{\mathrm{trk}} = \frac{N^{\mathrm{found}}}{N^{\mathrm{found}} + N^{\mathrm{un-found}}}$$

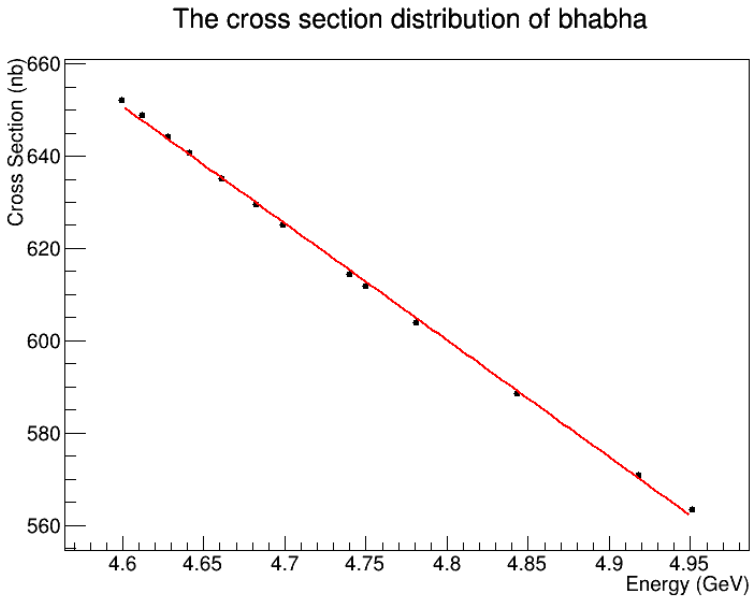
Background estimation

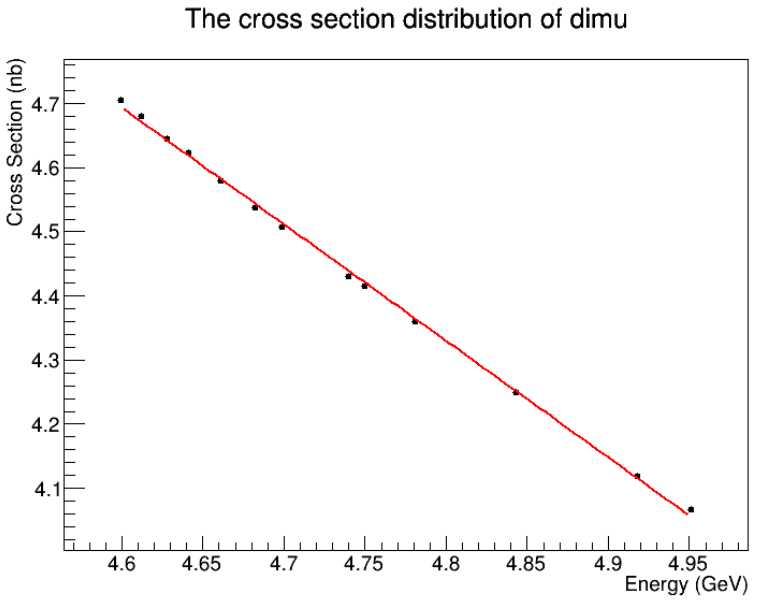
```
COVARIANCE MATRIX CALCULATED SUCCESSFULLY
FCN=-1.02436e+08 FROM HESSE     STATUS=OK             73 CALLS         343 TOTAL
                     EDM=0.00332626    STRATEGY= 1      ERROR MATRIX ACCURATE
 EXT PARAMETER                                   INTERNAL      INTERNAL
 NO.   NAME      VALUE            ERROR          STEP SIZE       VALUE
  1  frac         6.46653e-01   9.37826e-03   2.00945e-04   2.97683e-01
  2  mean0       -5.44284e-02   1.60238e-03   5.74043e-05  -5.44553e-02
  3  mean1        1.11483e-01   2.50043e-03   4.64202e-04   1.11716e-01
  4  nbkg         4.90826e+04   3.55421e+02   6.46118e-04  -1.83485e-02
  5  nsig         7.54763e+06   2.76132e+03   9.30280e-05   7.43044e-01
  6  pa1          1.03810e-02   8.00799e-03   1.56251e-04   1.03810e-03
  7  pb1         -2.89034e-01   1.15837e-02   3.78688e-05  -2.89074e-02
  8  sigma0       9.94202e-01   2.02748e-03   4.11132e-05  -6.46403e-01
  9  sigma1       7.23673e-01   3.82612e-03   4.21185e-05  -7.90252e-01
                               ERR DEF= 0.5
```



N_{sig}	N_{bkg}	Lum.(pb^{-1})	Lum.(pb^{-1}) (Nol)	Sys.
7547630	49083	103.4501	103.6992	0.2%

Cross section





$$\sigma^{obs}_{e^+e^-\to e^+e^-} = -253.272 * E_{cm} + 1815.82$$

$$\sigma^{obs}_{e^+e^-\to \mu^+\mu^-} = -1.81825 * E_{cm} + 13.0575$$

Cross section

E_{cm} (GeV)	$\sigma^{obs}_{e^+e^-\to e^+e^-}$ (nb)		$\sigma^{obs}_{e^+e^-\to \mu^+\mu^-}$ (nb)		Lum.(pb^{-1})		Sys.
4.59953	650.8878	650.6346	4.6944	4.6926	591.9319	592.1621	0.04
4.61186	647.7650	647.5117	4.6720	4.6702	104.064	104.1047	0.04
4.62800	643.6772	643.4239	4.6426	4.6408	526.3511	526.5582	0.04
4.64091	640.4074	640.1542	4.6192	4.6173	561.0383	561.2606	0.04
4.66124	635.2584	635.0052	4.5822	4.5804	533.1394	533.3519	0.04
4.68192	630.0208	629.7675	4.5446	4.5428	1675.211	1675.885	0.04
4.69882	625.7405	625.4872	4.5139	4.5121	539.0357	539.2538	0.04
4.73970	615.3867	615.1334	4.4395	4.4377	166.3066	166.375	0.04
4.75005	612.7653	612.5121	4.4207	4.4189	370.6007	370.7538	0.04
4.78054	605.0431	604.7898	4.3653	4.3635	516.9212	517.1376	0.04
4.84307	589.2060	588.9527	4.2516	4.2498	531.2234	531.4518	0.04
4.91802	570.2232	569.9700	4.1153	4.1135	210.5824	210.6759	0.04
4.95093	561.8881	561.6348	4.0555	4.0537	161.6991	161.772	0.04

$\Delta\phi$ cut range

E_{cm}	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1(\%)$
4.59953	0.9813	0.9814	0.01
4.61186	0.9811	0.9813	0.02
4.62800	0.9810	0.9814	0.04
4.64091	0.9809	0.9816	0.07
4.66124	0.9809	0.9816	0.07
4.68192	0.9809	0.9817	0.08
4.69882	0.9810	0.9813	0.03
4.73970	0.9808	0.9810	0.02
4.75005	0.9808	0.9811	0.03
4.78054	0.9810	0.9812	0.02
4.84307	0.9813	0.9817	0.04
4.91802	0.9813	0.9813	0.00
4.95093	0.9810	0.9819	0.09

$\Delta\theta$ cut range

E_{cm}	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1(\%)$
4.59953	0.9719	0.9729	0.10
4.61186	0.9718	0.9737	0.20
4.62800	0.9718	0.9730	0.12
4.64091	0.9718	0.9732	0.14
4.66124	0.9719	0.9719	0.00
4.68192	0.9717	0.9731	0.14
4.69882	0.9717	0.9722	0.05
4.73970	0.9718	0.9728	0.10
4.75005	0.9717	0.9742	0.26
4.78054	0.9718	0.9727	0.09
4.84307	0.9717	0.9731	0.14
4.91802	0.9717	0.9720	0.03
4.95093	0.9716	0.9729	0.13

Momentum cut range

E_{cm}	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1(\%)$
4.59953	0.9908	0.9904	-0.04
4.61186	0.9907	0.9902	-0.05
4.62800	0.9905	0.9905	0.00
4.64091	0.9906	0.9905	-0.01
4.66124	0.9905	0.9906	0.01
4.68192	0.9904	0.9896	-0.08
4.69882	0.9905	0.9904	-0.01
4.73970	0.9903	0.9900	-0.03
4.75005	0.9903	0.9904	0.01
4.78054	0.9904	0.9907	0.03
4.84307	0.9903	0.9903	0.00
4.91802	0.9902	0.9903	0.01
4.95093	0.9900	0.9896	-0.04

nGood requirement

E_{cm}	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1(\%)$
4.59953	0.9983	0.9987	0.04
4.61186	0.9984	0.9987	0.03
4.62800	0.9983	0.9986	0.03
4.64091	0.9983	0.9987	0.04
4.66124	0.9983	0.9988	0.05
4.68192	0.9983	0.9988	0.05
4.69882	0.9983	0.9987	0.04
4.73970	0.9983	0.9986	0.03
4.75005	0.9983	0.9988	0.05
4.78054	0.9983	0.9986	0.03
4.84307	0.9983	0.9988	0.05
4.91802	0.9983	0.9988	0.05
4.95093	0.9983	0.9987	0.04

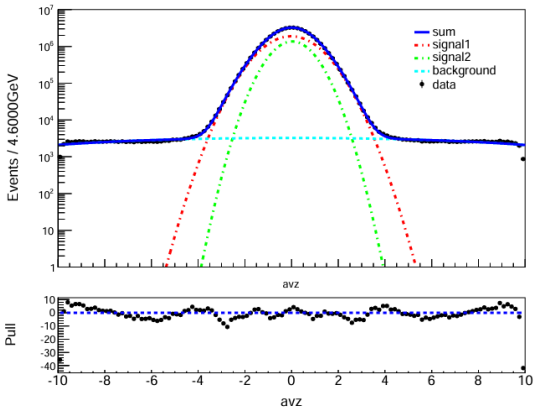
$cos\theta$ cut range

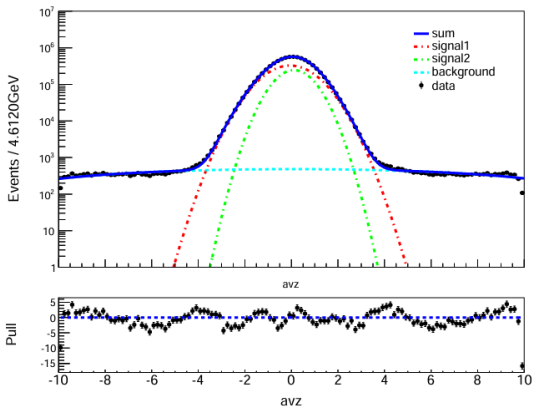
E_{cm}	ϵ_{data}	ϵ_{MC}	$\frac{\epsilon_{MC}}{\epsilon_{data}} - 1(\%)$
4.59953	0.9471	0.9470	-0.01
4.61186	0.9458	0.9459	0.01
4.62800	0.9452	0.9471	0.20
4.64091	0.9454	0.9470	0.17
4.66124	0.9456	0.9465	0.10
4.68192	0.9454	0.9467	0.14
4.69882	0.9455	0.9462	0.07
4.73970	0.9457	0.9462	0.05
4.75005	0.9464	0.9456	-0.08
4.78054	0.9455	0.9462	0.07
4.84307	0.9459	0.9483	0.25
4.91802	0.9461	0.9458	-0.03
4.95093	0.9441	0.9478	0.39

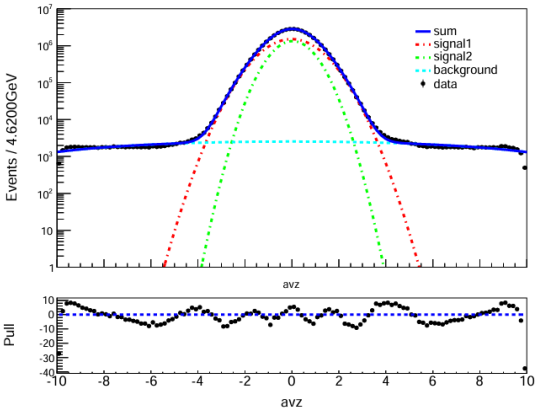
MC statistic

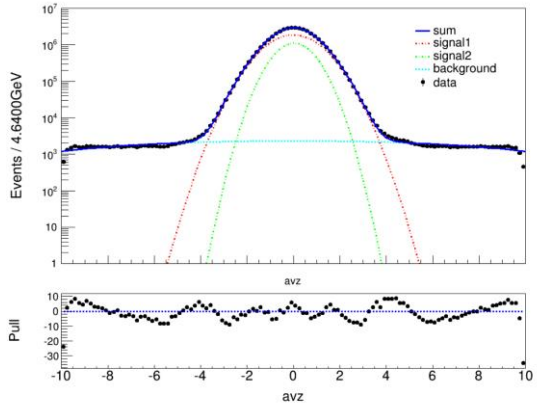
E_{cm}	N_{bha}	N_{dimu}	$\epsilon_{\ bha}$	$\epsilon_{\ dimu}$	$\Delta\epsilon_{\ bha}$	$\Delta\epsilon_{\ dimu}$	Lum.(pb^{-1})	Lum.(pb^{-1})	Lum.(pb^{-1})	Lum.(pb^{-1})	Lum.(pb^{-1})(Nol)	Sys.(%)
4.59953	1000000	950000	0.1078	0.6058	0.0003	0.0005	588.1378	591.2910	588.1755	591.3291	589.7291	0.27
4.61186	950000	1000000	0.1077	0.6049	0.0003	0.0005	103.4169	103.9721	103.4236	103.9788	103.6971	0.27
4.62800	1000000	1000000	0.1072	0.6040	0.0003	0.0005	523.5345	526.3590	523.5683	526.3931	524.9599	0.27
4.64091	1000000	1000000	0.1071	0.6040	0.0003	0.0005	558.2122	561.2261	558.2482	561.2625	559.7332	0.27
4.66124	1000000	1000000	0.1074	0.6032	0.0003	0.0005	530.7703	533.6288	530.8045	533.6633	532.2129	0.27
4.68192	1000000	950000	0.1076	0.6056	0.0003	0.0005	1668.7718	1677.7351	1668.8789	1677.8433	1673.2952	0.27
4.69882	950000	1000000	0.1072	0.6041	0.0003	0.0005	537.0411	539.9368	537.0757	539.9718	538.5024	0.27
4.73970	1000000	950000	0.1068	0.6035	0.0003	0.0005	165.7859	166.6835	165.7966	166.6944	166.2389	0.27
4.75005	950000	1000000	0.1071	0.6040	0.0003	0.0005	369.4363	371.4294	369.4601	371.4536	370.4422	0.27
4.78054	1000000	1000000	0.1071	0.6030	0.0003	0.0005	515.4089	518.1913	515.4422	518.2250	516.8131	0.27
4.84307	1000000	1000000	0.1074	0.6033	0.0003	0.0005	529.1939	532.0438	529.228	532.0782	530.6321	0.27
4.91802	1000000	1000000	0.1071	0.6012	0.0003	0.0005	209.4070	210.5377	209.4206	210.5513	209.9776	0.27
4.95093	1000000	1000000	0.1071	0.6011	0.0003	0.0005	160.5062	161.3731	160.5166	161.3836	160.9437	0.27

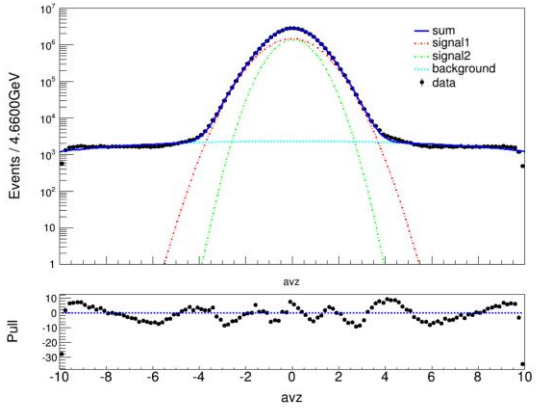
Background estimation

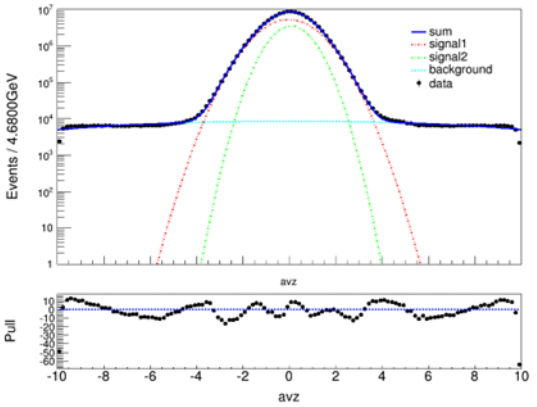




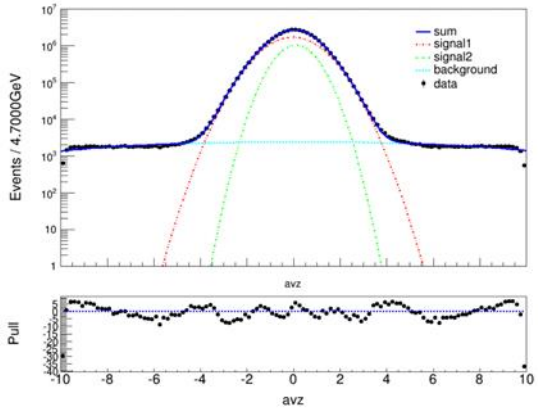


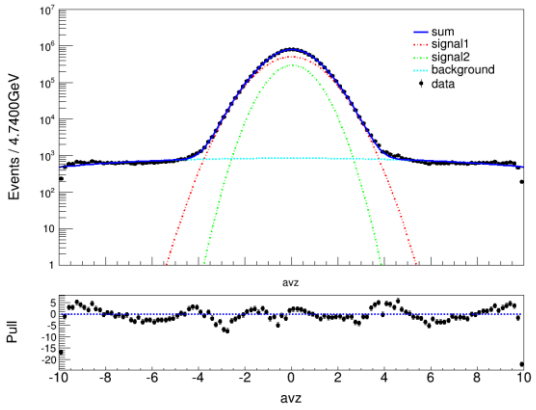


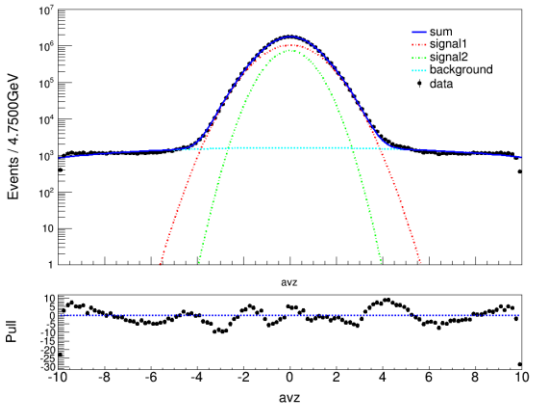


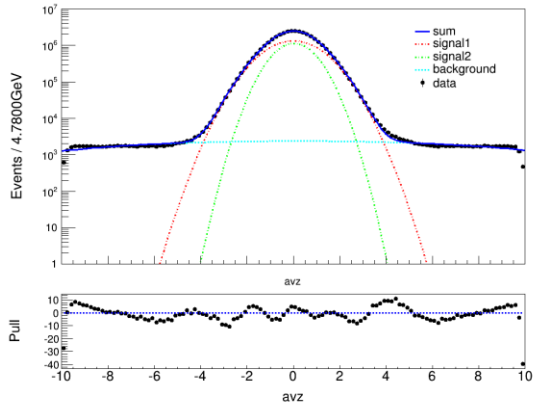


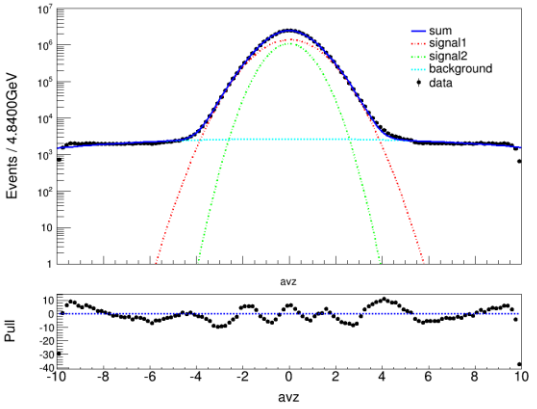
Background estimation

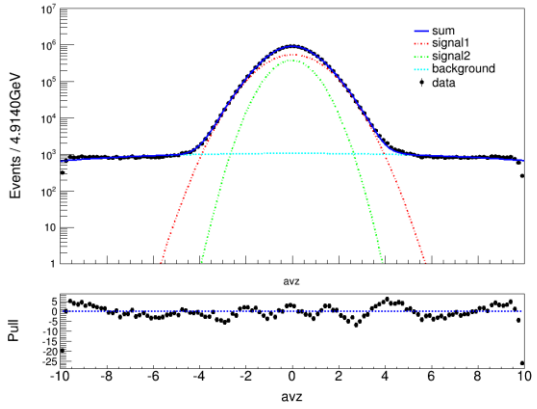




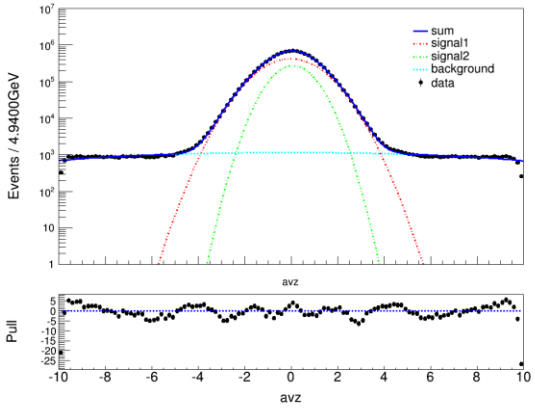








Background estimation



Background estimation

E_{cm} (GeV)	N_{sig}	N_{bkg}	Lum.(pb^{-1})	Lum.(pb^{-1}) (Nol)	Sys.(%)
4.59953	43208300	342498	588.3521	589.7291	0.23
4.61186	7547630	49083	103.4501	103.6971	0.23
4.62800	37757500	255765	523.7658	524.9599	0.22
4.64091	40014500	232864	558.2063	559.7332	0.27
4.66124	37817700	235568	530.7864	532.2129	0.27
4.68192	118179000	879086	1676.1700	1673.2952	0.17
4.69882	37647700	250112	537.1671	538.5024	0.24
4.73970	11375700	87513	166.6359	166.2389	0.23
4.75005	25338100	165444	371.4452	370.4422	0.27
4.78054	34889600	241533	518.3798	516.8131	0.30
4.84307	34999700	276726	532.2928	530.6321	0.31
4.91802	13405500	112390	210.7626	209.9776	0.37
4.95093	10144400	119921	161.6474	160.9437	0.43

Systematic Uncertainty

	Tracking efficiency	Uncertainty of Generator	nGood requirement	Momentum cut range	$cos\theta$	$\Delta\theta$	$\Delta\phi$	Cross section	MC statistics	Background estimation	Systematic Uncertainty
4.59953	0.30	0.10	0.04	-0.04	-0.01	0.10	0.01	0.04	0.27	0.23	0.50
4.61186	0.30	0.10	0.03	-0.05	0.01	0.20	0.02	0.04	0.27	0.23	0.53
4.62800	0.30	0.10	0.03	0.00	0.20	0.12	0.04	0.04	0.27	0.22	0.63
4.64091	0.30	0.10	0.04	-0.01	0.17	0.14	0.07	0.04	0.27	0.27	0.62
4.66124	0.30	0.10	0.05	0.01	0.10	0.00	0.07	0.04	0.27	0.27	0.54
4.68192	0.30	0.10	0.05	-0.08	0.14	0.14	0.08	0.04	0.27	0.17	0.58
4.69882	0.30	0.10	0.04	-0.01	0.07	0.05	0.03	0.04	0.27	0.24	0.51
4.73970	0.30	0.10	0.03	-0.03	0.05	0.10	0.02	0.04	0.27	0.23	0.50
4.75005	0.30	0.10	0.05	0.01	-0.08	0.26	0.03	0.04	0.27	0.27	0.59
4.78054	0.30	0.10	0.03	0.03	0.07	0.09	0.02	0.04	0.27	0.30	0.55
4.84307	0.30	0.10	0.05	0.00	0.25	0.14	0.04	0.04	0.27	0.31	0.74
4.91802	0.30	0.10	0.05	0.01	-0.03	0.03	0.00	0.04	0.27	0.37	0.56
4.95093	0.30	0.10	0.04	-0.04	0.39	0.13	0.09	0.04	0.27	0.43	1.00

Luminosity

E_{cm} (GeV)	Luminosity(publish)	Luminosity(measure)
4.59953	586.9±0.1±3.9	589.7291±0.09±2.9244
4.61186	103.65±0.05±0.55	103.6971±0.038±0.5478
4.62800	521.53±0.11±2.76	524.9599±0.085±3.3193
4.64091	551.65±0.12±2.92	559.7332±0.089±3.4933
4.66124	529.43±0.12±2.81	532.2129±0.087±2.8916
4.68192	1667.39±0.21±8.84	1673.2952±0.154±9.6979
4.69882	535.54±0.12±2.84	538.5024±0.088±2.7305
4.73970	163.87±0.07±0.87	166.2389±0.090±0.8350
4.75005	366.55±0.10±1.94	370.4422±0.074±2.1740
4.78054	511.47±0.12±2.71	516.8131±0.088±2.8170
4.84307	525.16±0.12±2.78	530.6321±0.090±3.9148
4.91802	207.82±0.08±1.10	209.9776±0.057±1.1856
4.95093	159.28±0.07±0.84	160.9437±0.051±1.6101

Test / 4.6000 GeV

Collision	43324606	42917242	99.06%
Bhabha	41274212	41274212	100.00%
Dimu	1673101	1671734	99.92%
Digam	223	235	105.38%
Ditau	7890	7758	98.33%
EEee	19220	19021	98.96%
EEeta	1	1	100.00%
EEetap	2	2	100.00%
EEkk	2192	1956	89.23%
EEpipi	3408	3214	94.31%
EEuu	1930	1921	99.53%
qqbar	41478	39993	96.42%

luminosity	publish	measure	Measure(emc)	
	586.89	589.7291	585.4851	
		+0.005	-0.002	+0.007

Test / 4.6120 GeV

Collision	7553823	7493503	99.20%
Bhabha	7242049	7241837	100.00%
Dimu	293434	293161	99.91%
Digam	109	93	85.32%
Ditau	1419	1391	98.03%
EEee	4790	4106	85.72%
EEeta	1	1	100.00%
EEetap	4	4	100.00%
EEkk	388	335	86.34%
EEpipi	630	590	93.65%
EEuu	279	289	103.58%
qqbar	7294	7149	98.01%

luminosity	publish	measure	Measure(emc)	
	103.65	103.6971	102.8870	
		0	-0.007	+0.007

Test / 4.6200 GeV

Collision	37779810	37459548	99.15%
Bhabha	35996022	35994343	100.00%
Dimu	1463447	1462083	99.91%
Digam	630	510	80.95%
Ditau	7032	6911	98.28%
EEee	23632	21160	89.54%
EEeta	14	11	78.57%
EEetap	6	5	83.33%
EEkk	1879	1694	90.15%
EEpipi	2911	2707	92.99%
EEuu	1815	1796	98.95%
qqbar	36060	34781	96.45%

luminosity	publish	measure	Measure(emc)	
	521.53	524.9599	520.6050	
		+0.007	-0.002	+0.008

Test / 4.6400 GeV

Collision	40032609	39562850	98.83%
Bhabha	37836518	37834751	100.00%
Dimu	1540204	1538745	99.91%
Digam	605	571	94.38%
Ditau	7577	7453	98.36%
EEee	26497	24429	92.20%
EEeta	6	6	100.00%
EEetap	7	5	71.43%
EEkk	2070	1875	90.58%
EEpipi	3375	3163	93.72%
EEuu	1915	1880	98.17%
qqbar	36857	37113	100.69%

luminosity	publish	measure	Measure(emc)	
	551.65	559.7331	553.2310	
		+0.014	+0.003	+0.011

Test / 4.6600 GeV

Collision	37833503	37519348	99.17%
Bhabha	36097899	36095881	99.99%
Dimu	1462502	1461123	99.91%
Digam	598	500	83.61%
Ditau	7269	7150	98.36%
EEee	25078	22988	91.67%
EEeta	4	2	50.00%
EEetap	9	9	100.00%
EEkk	1913	1707	89.23%
EEpipi	3017	2839	94.10%
EEuu	1676	1647	98.27%
qqbar	36106	34806	96.40%

luminosity	publish	measure	Measure(emc)	
	529.43	532.2128	527.8890	
		+0.005	-0.003	+0.008

Test / 4.6800 GeV

Collision	118213735	117324001	99.25%
Bhabha	112977749	112977749	100.00%
Dimu	4582211	4577998	99.91%
Digam	1799	1663	92.44%
Ditau	23077	22683	98.29%
EEee	79967	71870	89.87%
EEeta	30	27	90.00%
EEetap	30	22	73.33%
EEkk	6337	5722	90.30%
EEpipi	9540	8968	94.00%
EEuu	5232	5144	98.32%
qqbar	111410	109736	98.50%

luminosity	publish	measure	Measure(emc)	
	1667.39	1673.2952	1660.9000	
		+0.004	-0.004	+0.007

Test / 4.7000 GeV

Collision	37634141	37338117	99.21%
Bhabha	35891157	35893976	100.01%
Dimu	1458090	1456838	99.91%
Digam	638	411	64.42%
Ditau	7402	7276	98.30%
EEee	27834	25256	90.74%
EEeta	15	14	93.33%
EEetap	13	11	84.62%
EEkk	2051	1853	90.35%
EEpipi	3240	3045	93.98%
EEuu	1835	1784	97.22%
qqbar	35261	35402	100.40%

luminosity	publish	measure	Measure(emc)	
	535.54	538.5024	534.2818	
		+0.006	-0.002	+0.008

Test / 4.7400 GeV

Collision	11371779	11286323	99.25%
Bhabha	10748765	10748966	100.00%
Dimu	438113	437726	99.91%
Digam	159	130	81.76%
Ditau	2314	2274	98.27%
EEee	7660	6606	86.24%
EEeta	4	4	100.00%
EEetap	1	1	100.00%
EEkk	628	584	92.99%
EEpipi	898	850	94.65%
EEuu	521	513	98.46%
qqbar	10999	10954	99.59%

luminosity	publish	measure	Measure(emc)	
	163.87	166.2389	165.0084	
		+0.014	+0.006	+0.007

Test / 4.7500 GeV

Collision	25321734	25110193	99.16%
Bhabha	24026829	24024941	99.99%
Dimu	977347	976475	99.91%
Digam	435	399	91.72%
Ditau	5165	5092	98.59%
EEee	17478	16194	92.65%
EEeta	4	1	25.00%
EEetap	10	8	80.00%
EEkk	1424	1280	89.89%
EEpipi	2070	1953	94.35%
EEuu	1185	1177	99.32%
qqbar	24283	24176	99.56%

luminosity	publish	measure	Measure(emc)	
	366.55	370.4422	367.4077	
		+0.010	+0.002	+0.008

Test / 4.7800 GeV

Collision	34853144	34585073	99.23%
Bhabha	33080106	33082887	100.01%
Dimu	1344428	1343207	99.91%
Digam	420	330	78.57%
Ditau	7352	7249	98.60%
EEee	20520	18229	88.84%
EEeta	4	1	25.00%
EEetap	9	8	88.89%
EEkk	1917	1729	90.19%
EEpipi	2912	2751	94.47%
EEuu	1623	1623	100.00%
qqbar	34234	34012	99.35%

luminosity	publish	measure	Measure(emc)	
	511.47	516.8131	512.8524	
		+0.010	+0.002	+0.008

Test / 4.8400 GeV

Collision	34964367	34684282	99.20%
Bhabha	33184371	33184371	100.00%
Dimu	1346327	1345040	99.90%
Digam	620	510	82.26%
Ditau	7673	7561	98.54%
EEee	23979	21907	91.36%
EEeta	8	4	50.00%
EEetap	7	7	100.00%
EEkk	1943	1740	89.55%
EEpipi	2993	2834	94.69%
EEuu	1760	1751	99.49%
qqbar	34879	34510	98.94%

luminosity	publish	measure	Measure(emc)	
	525.16	530.6321	526.4383	
		+0.010	+0.002	+0.008

Test / 4.9140 GeV

Collision	13379918	13285814	99.30%
Bhabha	12703706	12703943	100.00%
Dimu	514629	514366	99.95%
Digam	184	180	97.83%
Ditau	2381	3075	129.15%
EEee	5759	9036	156.90%
EEeta	1	1	100.00%
EEetap	1	3	300.00%
EEkk	760	730	96.05%
EEpipi	931	1017	109.24%
EEuu	420	624	148.57%
qqbar	13910	13626	97.96%

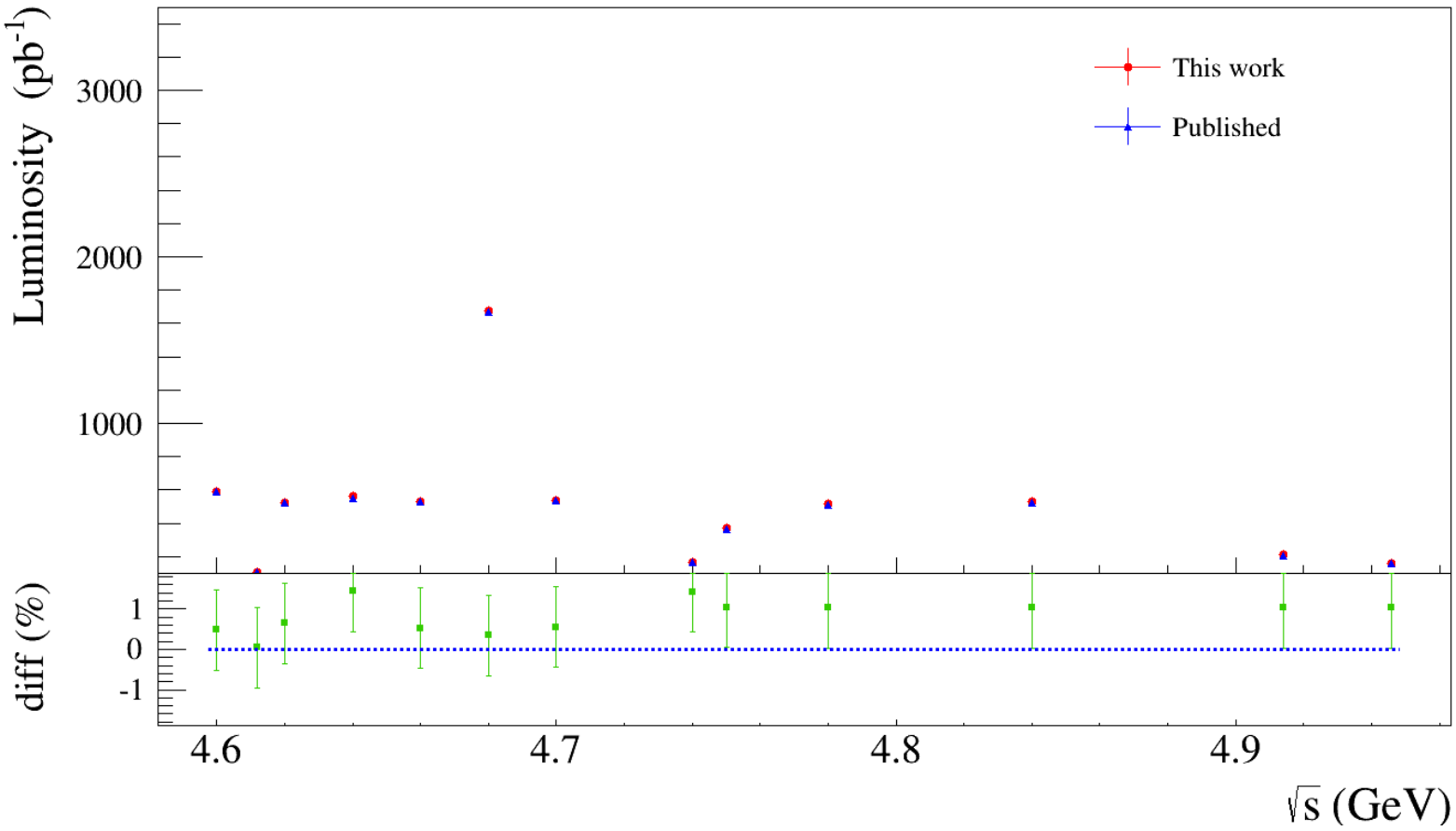
luminosity	publish	measure	Measure(emc)	
	207.82	209.9776	208.4365	
		+0.010	+0.003	+0.007

Test / 4.9460 GeV

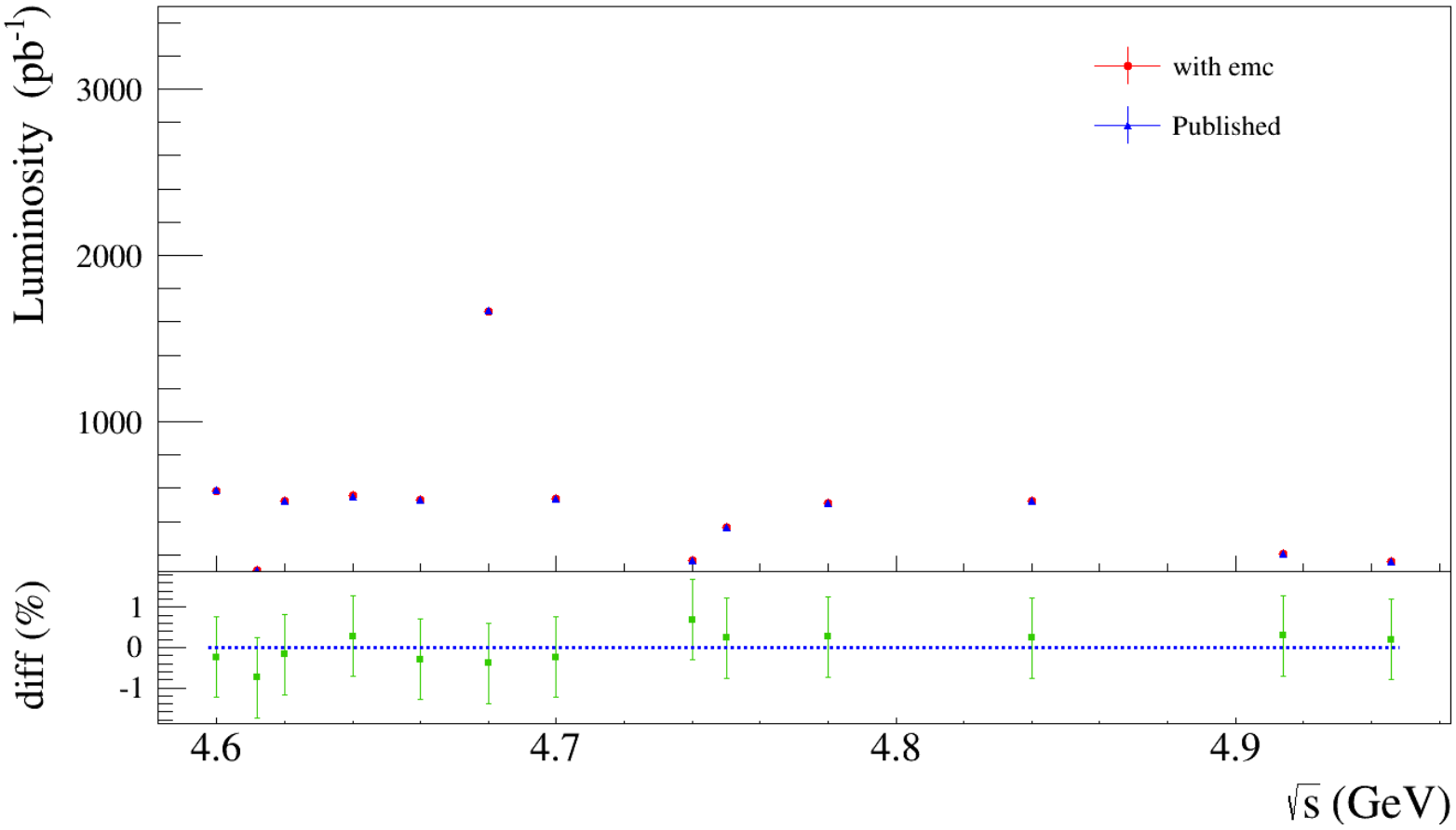
Collision	10120766	10034998	99.15%
Bhabha	9606504	9606863	100.00%
Dimu	389325	388867	99.88%
Digam	113	96	84.96%
Ditau	2398	2367	98.71%
EEee	5518	4757	86.21%
EEeta	1	1	100.00%
EEetap	1	1	100.00%
EEkk	588	533	90.65%
EEpipi	883	834	94.45%
EEuu	487	479	98.36%
qqbar	10539	10406	98.74%

luminosity	publish	measure	Measure(emc)	
	159.28	160.9437	159.5954	
		+0.010	+0.002	+0.008

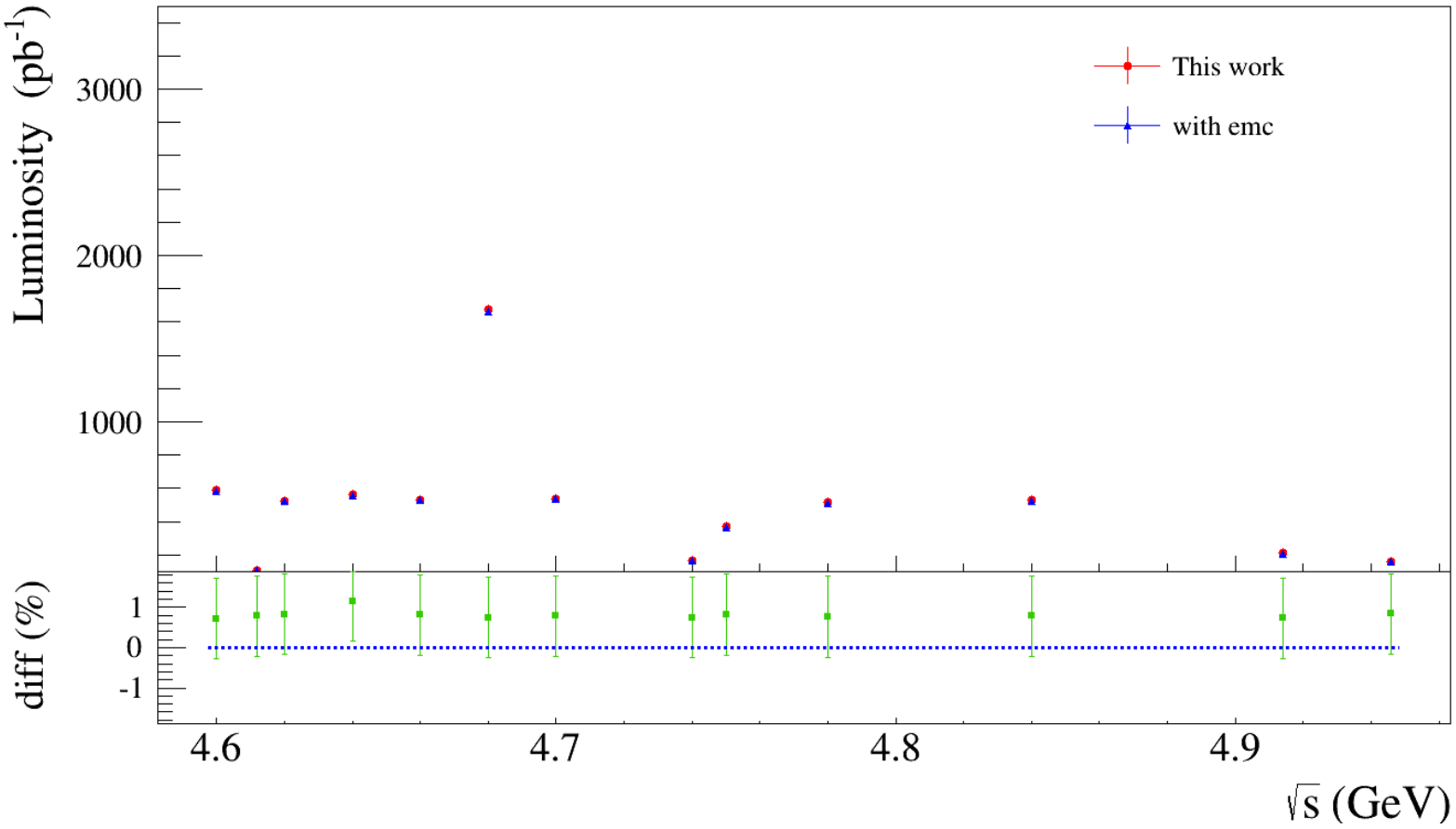
Luminosity


Luminosity (pb^{-1})
3000
2000
1000
This work
Published
diff (%)
1
0
-1
4.6
4.7
4.8
4.9
$\sqrt{s}$ (GeV)

Luminosity


Luminosity (pb^{-1})
3000
2000
1000
with emc
Published
diff (%)
1
0
-1
4.6
4.7
4.8
4.9
$\sqrt{s}$ (GeV)

Luminosity


Luminosity (pb^{-1})
3000
2000
1000
This work
with emc
diff (%)
1
0
-1
4.6
4.7
4.8
4.9
$\sqrt{s}$ (GeV)