

Search of $J/\psi \rightarrow \gamma\eta'$ $\gamma\eta' \rightarrow \pi^0\pi^0 e^+e^-, \pi^0\pi^0\mu^+\mu^-$

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数据样本

➤ BOSS 版本: 7.0.8

➤ Decay:

$J/\psi \rightarrow \gamma\eta'$	HELAMP
$\gamma\eta' \rightarrow \pi^0\pi^0 e^+ e^-$	DIYEtapEEPi0Pi0
$\gamma\eta' \rightarrow \pi^0\pi^0 \mu^+ \mu^-$	PHSP
$\pi^0 \rightarrow \gamma\gamma$	PHSP

➤ Job:

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$:

SignalMC (09+12+18+19) + Data (09+12) + Inclusive MC (09+12)

$\eta' \rightarrow \mu^+ \mu^- \pi^0 \pi^0$:

SignalMC (09+12+18+19) + Data (09+12) + Exclusive MC (09+12+18+19)

初步事例挑选

- 好带点径迹的选择

- $|V_r| < 1.0\text{cm}, |V_z| < 10.0\text{cm}, |\cos\theta| < 0.93$

- $N=2, N_p = N_m = 1$

- 好光子的选择

- $E_{\text{barrel}} > 25\text{MeV}, |\cos\theta| < 0.8$

- $E_{\text{endcap}} > 50\text{MeV}, |\cos\theta| = (0.86, 0.92)$

- $\text{TDC}: 0 < t < 14$

- $N_y \geq 5$

- 顶点拟合

- 对带点径迹 e^+e^- 进行顶点拟合

- 1C 运动学拟合 π^0

- 6C 运动学拟合 $J/\psi \rightarrow e^+e^-/\mu^+\mu^-\gamma\gamma\gamma\gamma$

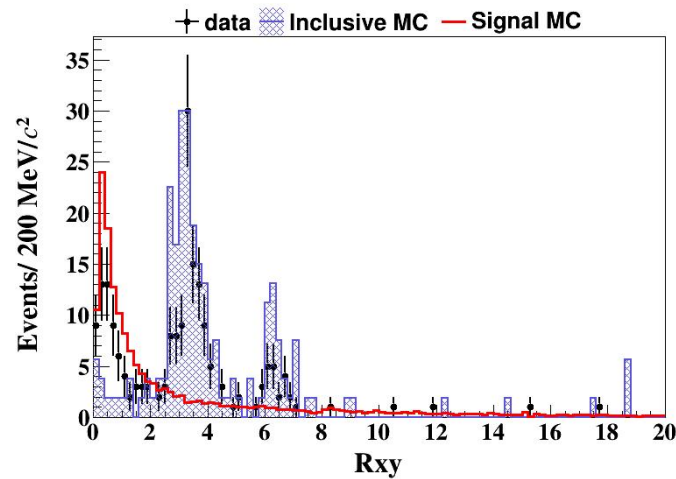
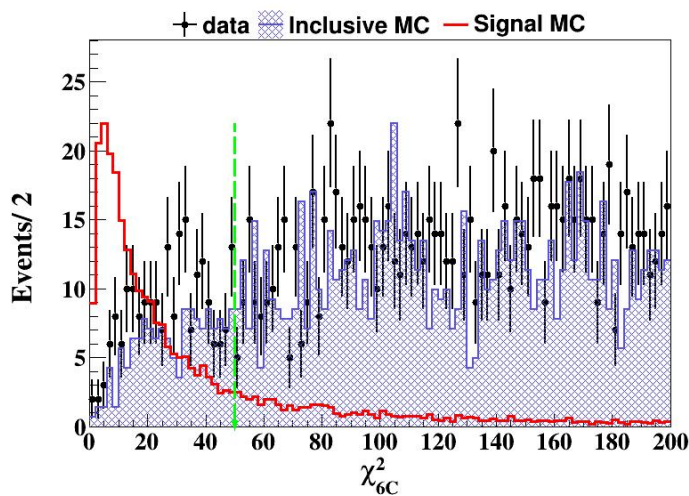
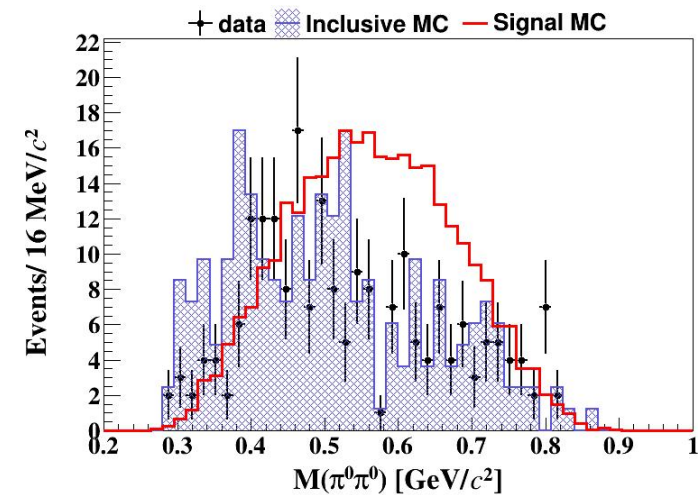
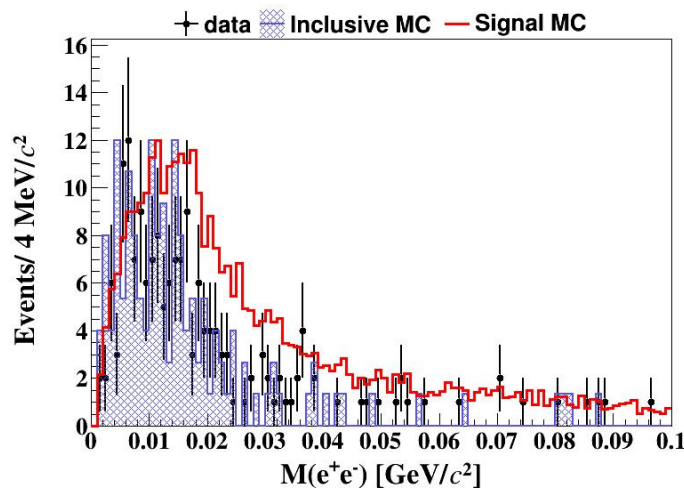
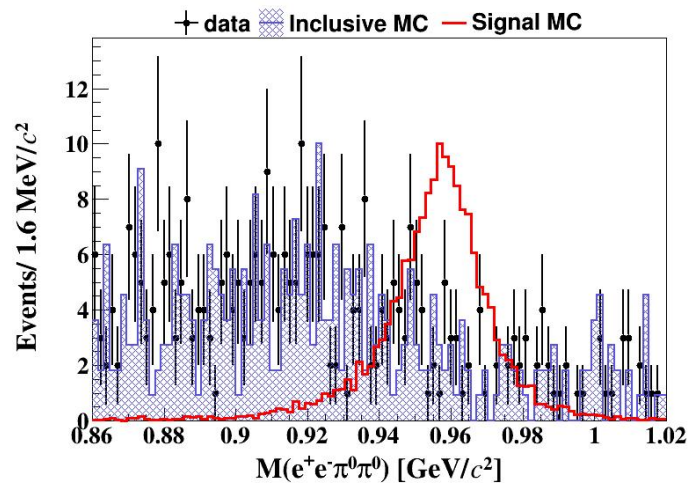
- 对所选的光子进行1C和6C运动学拟合，将它们的不不变质量约束在 π^0 的质量上。



Analysis of $\eta' \rightarrow \pi^0 \pi^0 e^+ e^-$

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ 分析

■ $\eta' \rightarrow e^+ e^- \pi^0 \pi^0$:



■ $m_{2\pi^0 e} > 0.9$ && $m_{2\pi^0 e} < 1$

■ $\chi^2_{6c} < 50$

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ 分析

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ gamma conversion:

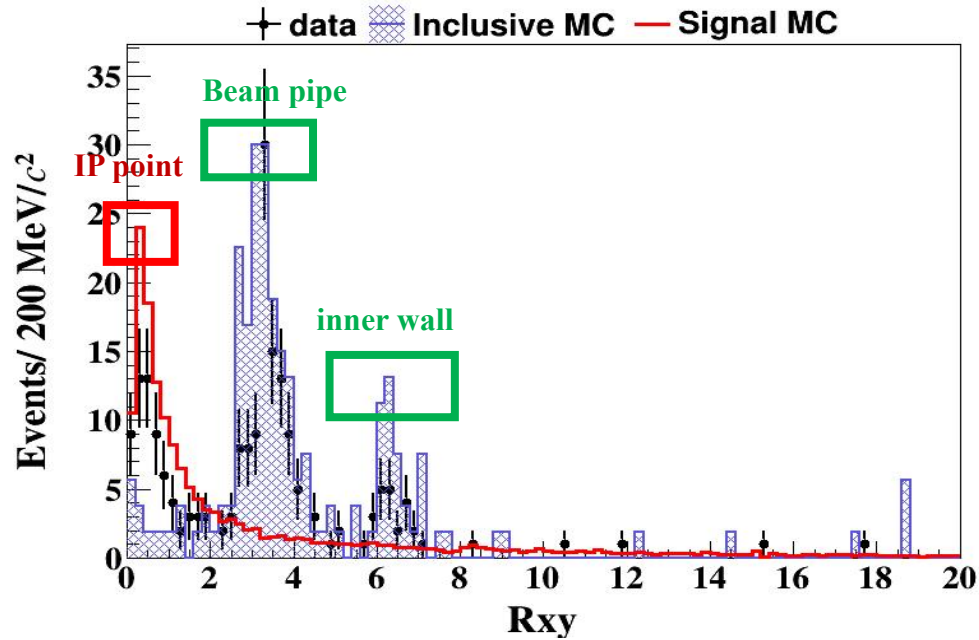


Table 1: Decay trees and their respective final states.

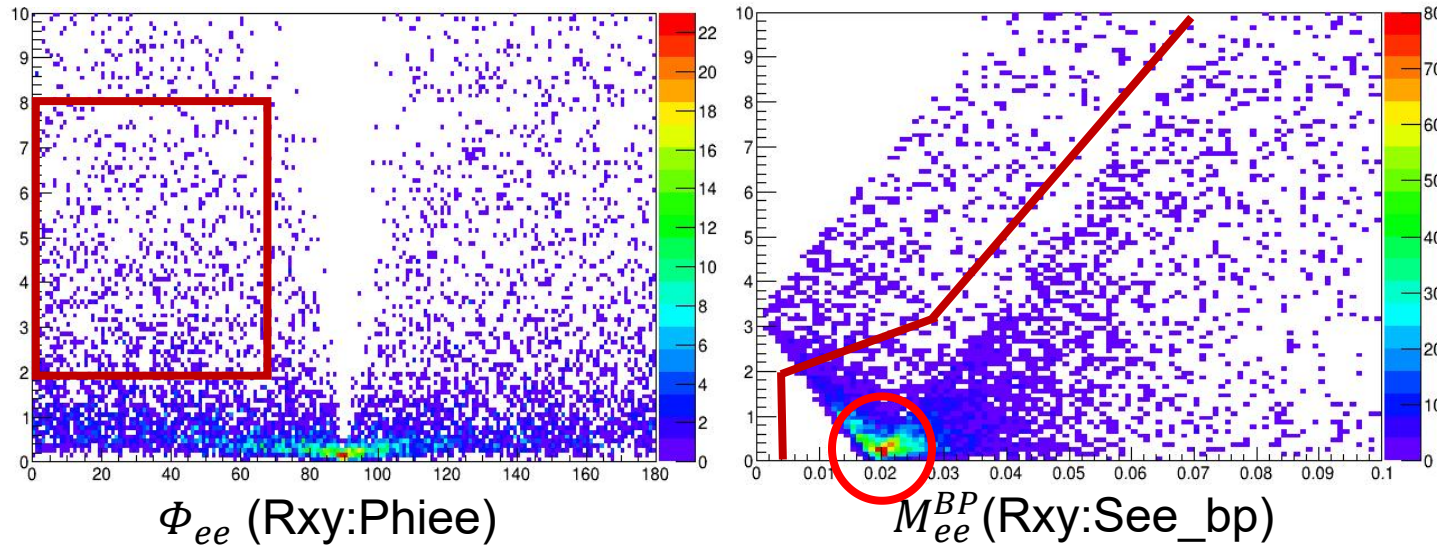
rowNo	decay tree	decay final state	iDcyTr	nEtr	nCEtr
1	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \eta, \eta \rightarrow \gamma \gamma$	$\pi^0 \pi^0 \gamma \gamma \gamma$	0	168	168
2	$J/\psi \rightarrow \pi^0 \pi^0 \gamma$	$\pi^0 \pi^0 \gamma$	2	21	189
3	$J/\psi \rightarrow \pi^0 \pi^0 \gamma, \pi^0 \rightarrow e^+ e^- \gamma^F$	$e^+ e^- \pi^0 \gamma^F \gamma$	10	13	202
4	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \rightarrow e^+ e^- \gamma^F$	$e^+ e^- \pi^0 \pi^0 \gamma^F \gamma$	4	9	211
5	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \eta, \pi^0 \rightarrow e^+ e^- \gamma^F, \eta \rightarrow \gamma \gamma$	$e^+ e^- \pi^0 \gamma^F \gamma \gamma$	1	8	219
6	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \pi^0$	$\pi^0 \pi^0 \pi^0 \gamma$	3	6	225
7	$J/\psi \rightarrow \pi^0 \pi^0 \omega, \omega \rightarrow \pi^0 \gamma$	$\pi^0 \pi^0 \pi^0 \gamma$	12	5	230
8	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \gamma \gamma$	$\pi^0 \gamma \gamma \gamma$	9	4	234
9	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \eta, \eta \rightarrow e^+ e^- \gamma^F$	$e^+ e^- \pi^0 \pi^0 \gamma^F \gamma$	6	4	238
10	$J/\psi \rightarrow f_1(1285) \gamma, f_1(1285) \rightarrow \pi^0 a_0^0, a_0^0 \rightarrow \pi^0 \eta, \eta \rightarrow \gamma \gamma$	$\pi^0 \pi^0 \gamma \gamma \gamma$	7	4	242
11	$J/\psi \rightarrow \pi^0 b_1^0, b_1^0 \rightarrow \pi^0 \omega, \omega \rightarrow \pi^0 \gamma$	$\pi^0 \pi^0 \pi^0 \gamma$	8	3	245
12	$J/\psi \rightarrow \pi^0 \omega, \omega \rightarrow \pi^0 \gamma$	$\pi^0 \pi^0 \gamma$	5	3	248
13	$J/\psi \rightarrow f_1(1285) \gamma, f_1(1285) \rightarrow \pi^0 \pi^0 \eta, \pi^0 \rightarrow e^+ e^- \gamma^F, \eta \rightarrow \gamma \gamma$	$e^+ e^- \pi^0 \gamma^F \gamma \gamma \gamma$	11	2	250
14	$J/\psi \rightarrow \eta' \gamma, \eta' \rightarrow \pi^0 \pi^0 \eta, \pi^0 \rightarrow e^+ e^- \gamma^F \gamma^f, \eta \rightarrow \gamma \gamma$	$e^+ e^- \pi^0 \gamma^F \gamma \gamma \gamma^f$	15	2	252

Cut	Efficiency
$0.9 < M_{2\pi^0 e} < 1$	11.34%
$\chi^2_{6c} < 50$	8.84%
$R_{xy} < 2$	5.22%

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ 分析

$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ gamma conversion:

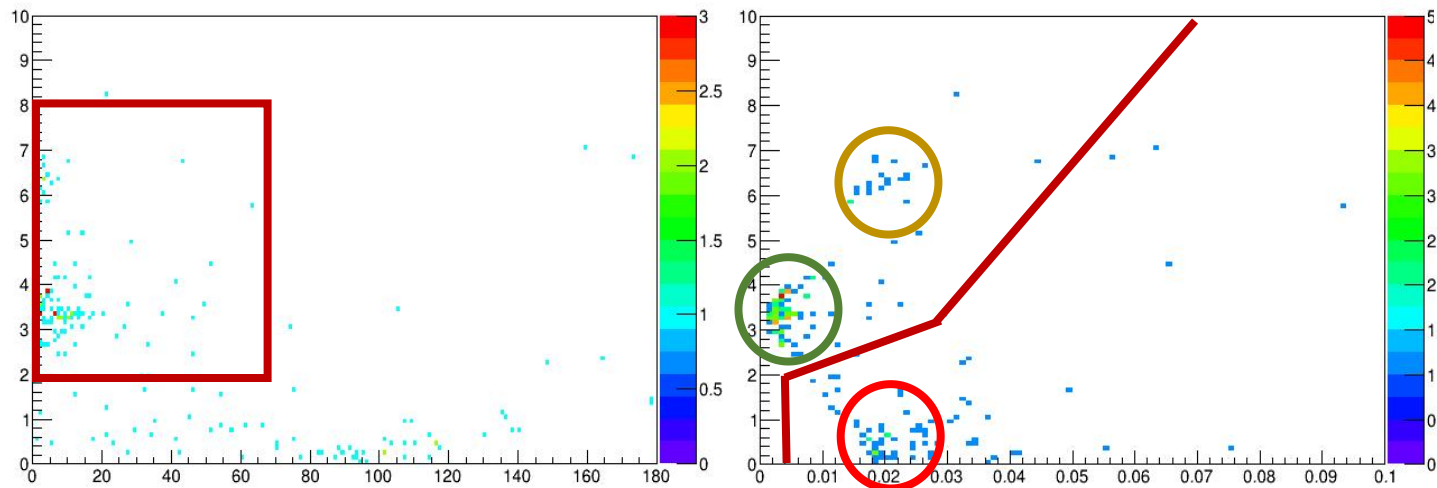
Signal MC



$m_{2\pi^0} > 0.9$ && $m_{2\pi^0} < 1$
 $x_{6c}^2 < 50$

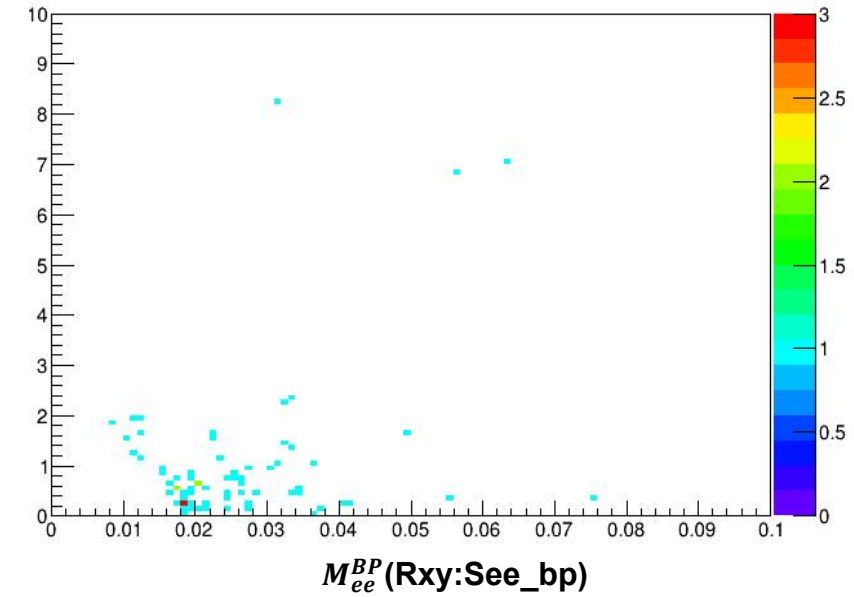
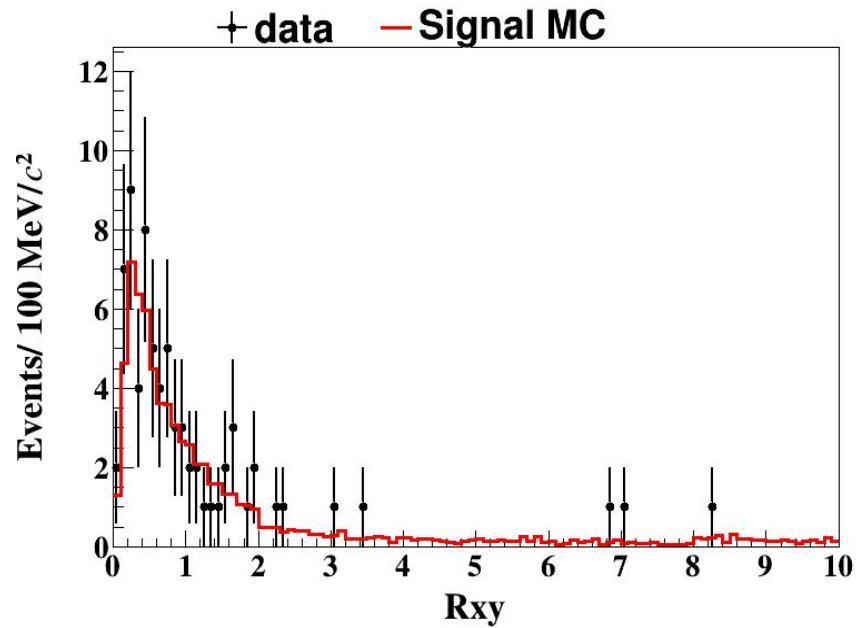
Cut	Range
Φ_{ee} vs. R_{xy}	$2.0 < R_{xy} < 8$ && $0 < \Phi_{ee} < 70^\circ$

Data



$\eta' \rightarrow e^+ e^- \pi^0 \pi^0$ 分析

■ $\eta' \rightarrow e^+ e^- \pi^0 \pi^0$:



Cut	Efficiency
$0.9 < M_{2\pi^0 e} < 1$	11.34%
$\chi^2_{6c} < 50$	8.84%
$R_{xy} \ \&\& \ \phi_{ee}$	7.88%

Analysis of $\eta' \rightarrow \mu^+ \mu^- \pi^0 \pi^0$

$\eta' \rightarrow \mu^+ \mu^- \pi^0 \pi^0$ 分析

