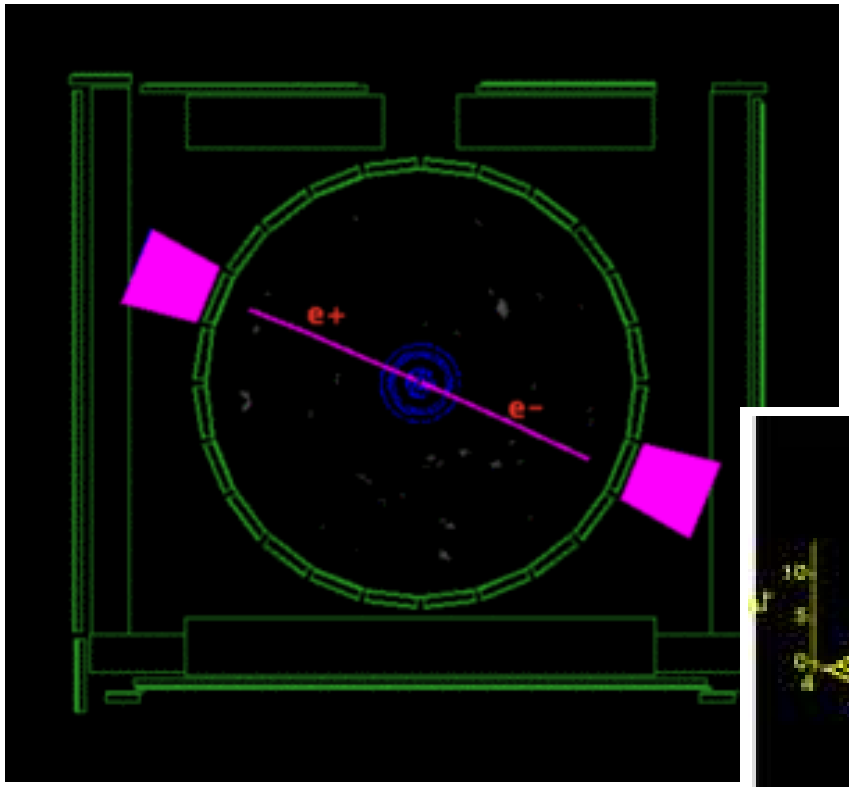
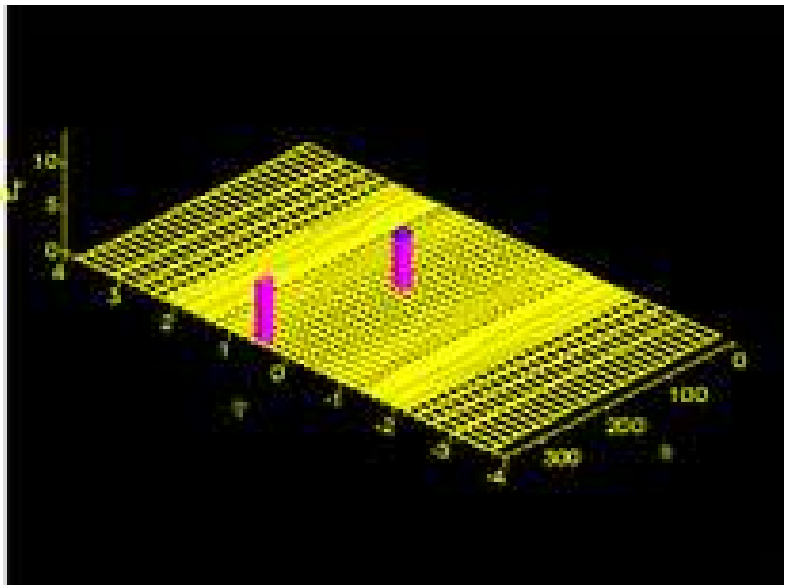
Exclusive e^+e^- and $\gamma\gamma$



- Questions from last week
- Plots for blessing
- Numbers for blessing

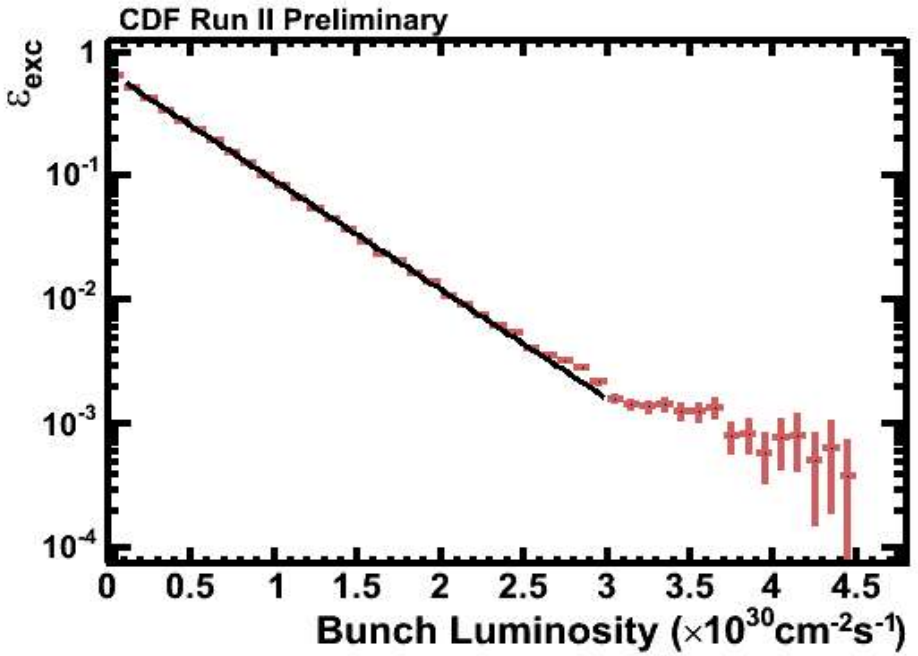


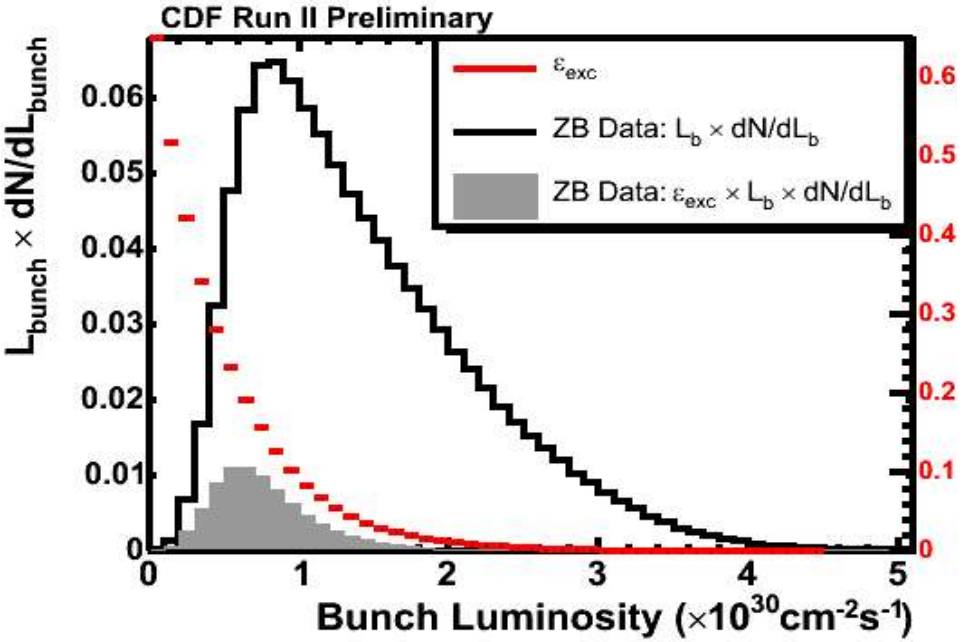
CDFNOTES: 7930, 7931

contact: Andrew Hamilton (ahamil@fnal.gov)

Exclusive Efficiency :: e^+e^- and $\gamma\gamma$

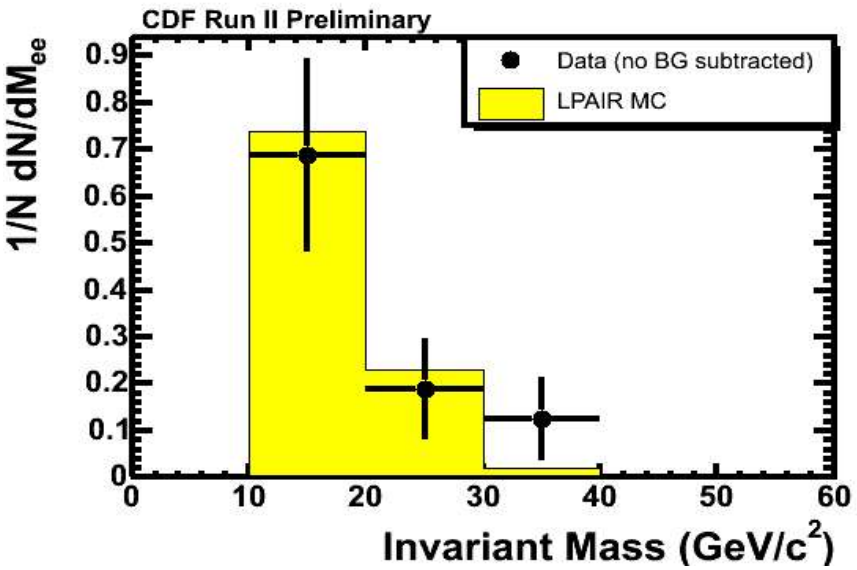
exclusive efficiency →

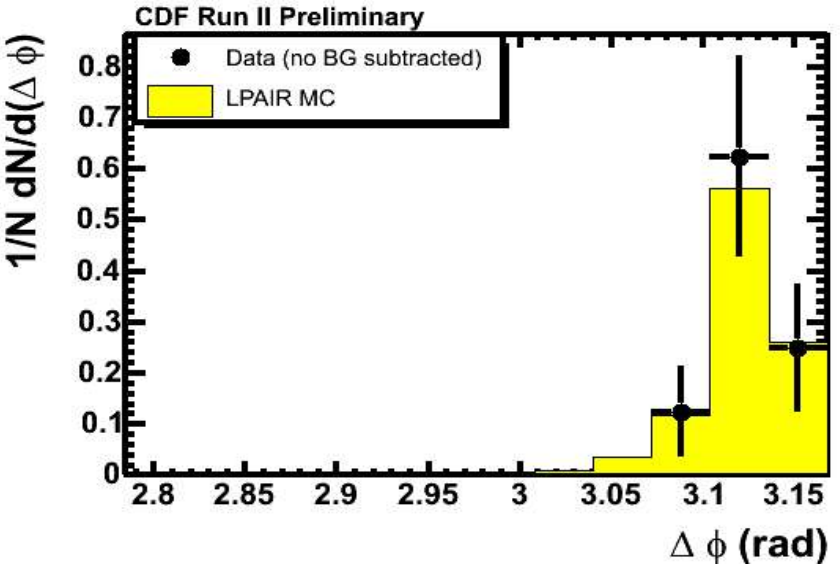


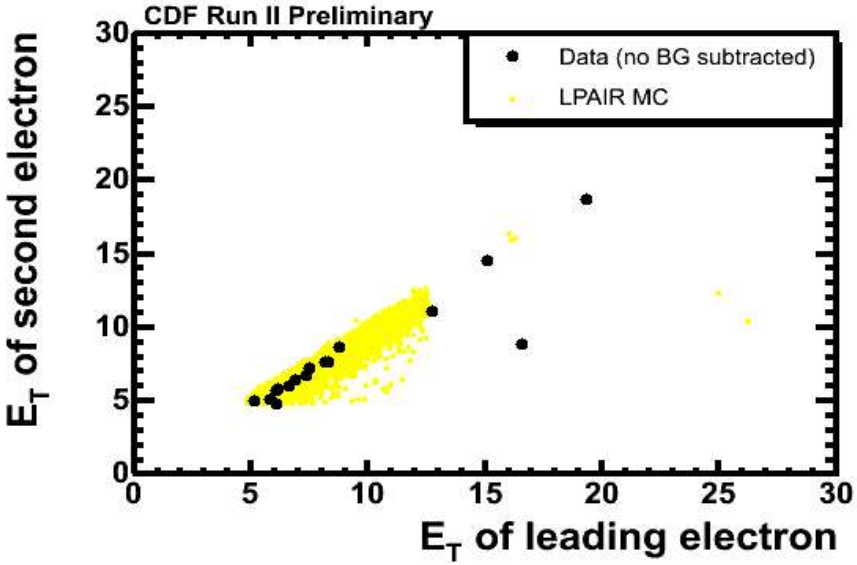


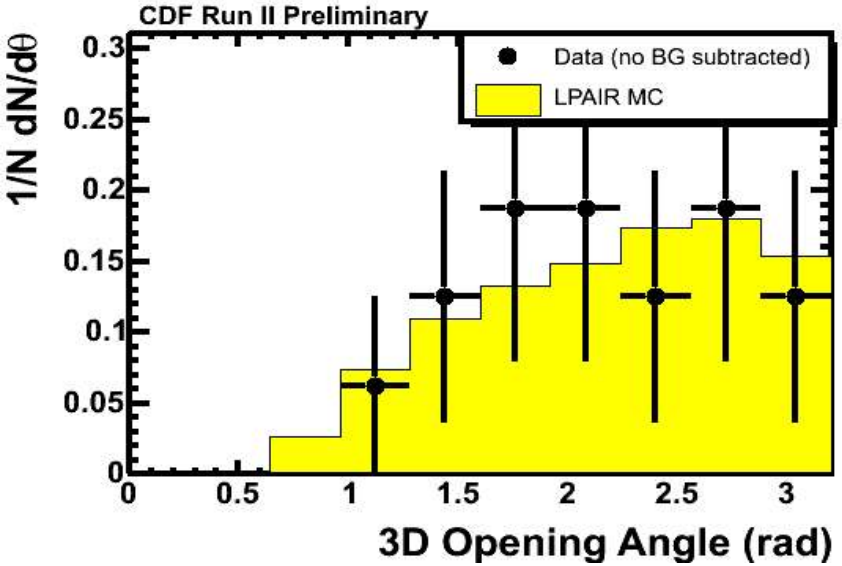
← effective luminosity

e^+e^- comparison to LPAIR MC

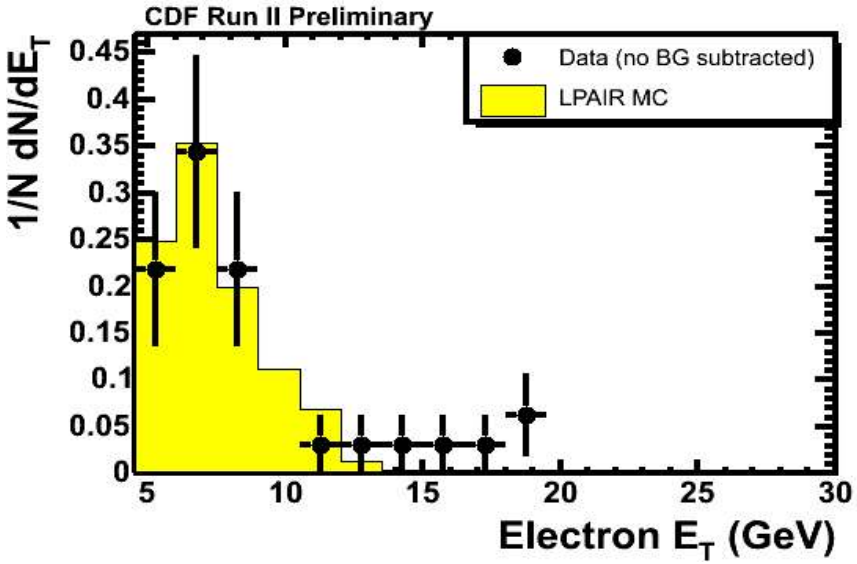


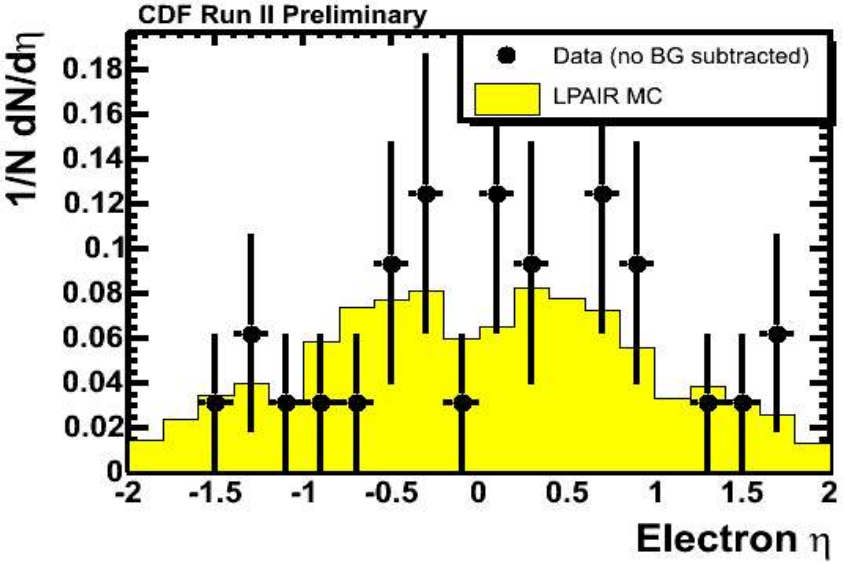


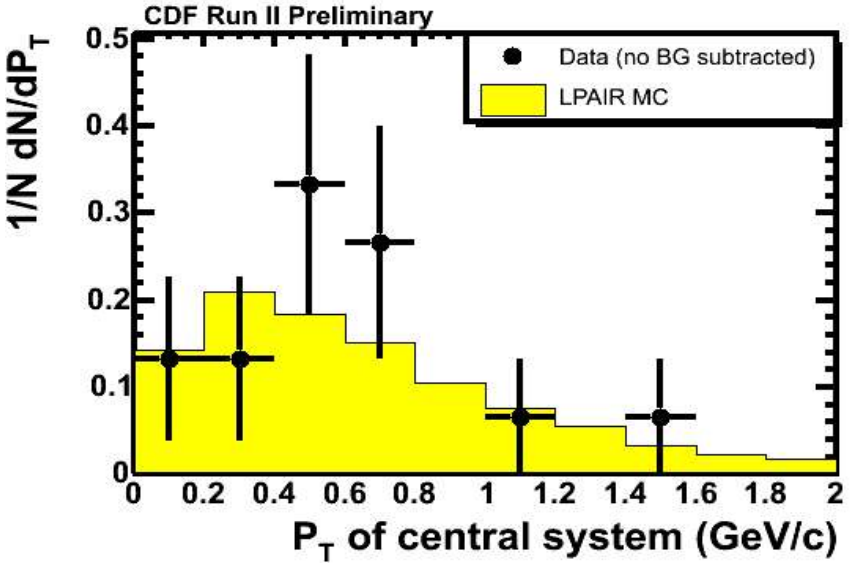


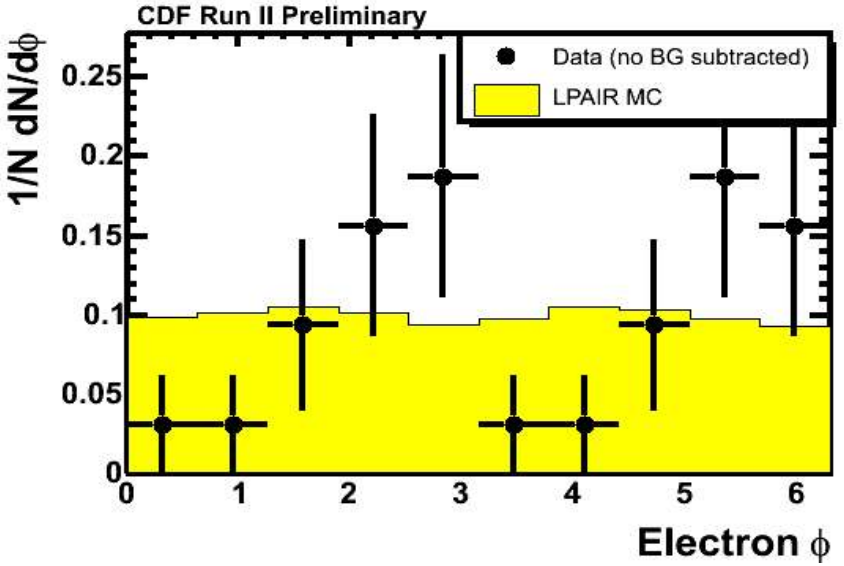


e^+e^- comparison to LPAIR MC



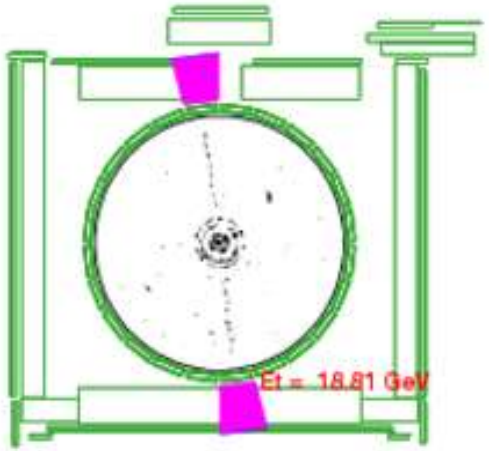


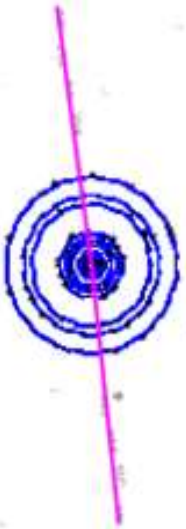


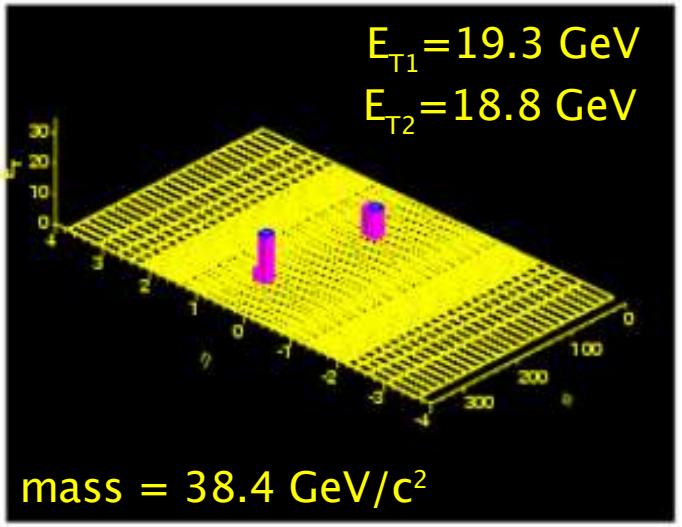


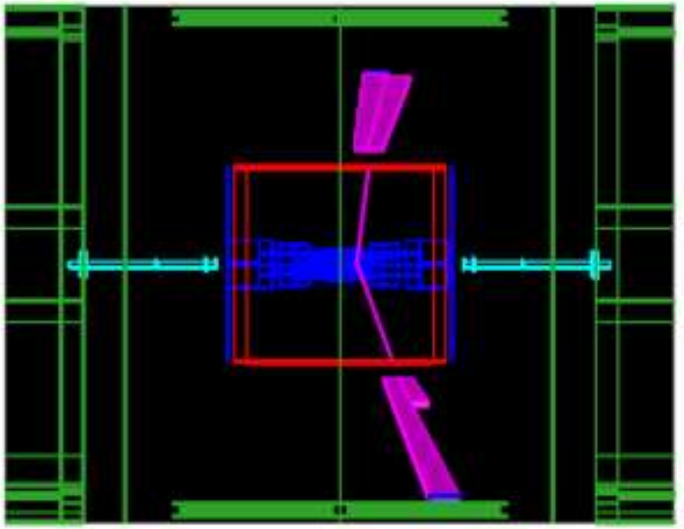
e^+e^- Event Display Sample

Run: 201155 Event: 151042

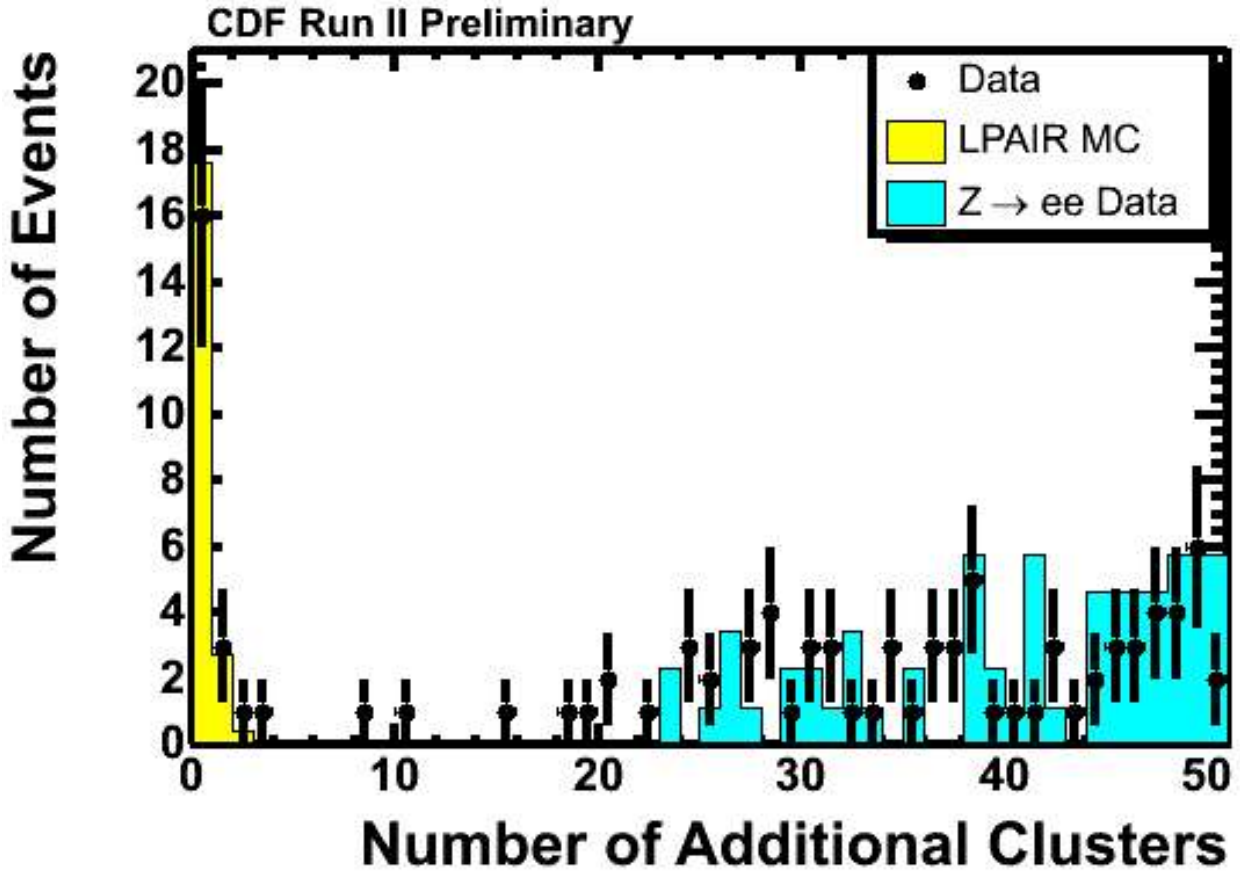








e^+e^- Exclusivity Background



Background Numbers for e^+e^-

ee Background Summary:

Fakes:	$0.0\ ^{+0.1}_{-0.0}$ events
Cosmic:	negligible
Exclusive:	$0.0\ ^{+0.3}_{-0.0}$ events
Dissociation:	2.1 ± 0.3 events
Total:	$\boldsymbol{2.1\ ^{+0.7}_{-0.3}}$ ***events***

Cross Section Numbers for e^+e^-

$$\sigma = \frac{N_{candidates} - N_{background}}{\varepsilon_{cosmic}\,\varepsilon_{fsr}\,\varepsilon_{ee}\,\mathscr{L}_{eff}}$$

$N_{candidates} = 16\,^{+5.1}_{-3.2}$ (stat)

$N_{background} = 2.1\,^{+0.7}_{-0.3}$ (sys)

$\mathscr{L}_{eff} = 46 \pm 3$ (sys) pb^{-1}

$\varepsilon_{fsr} = 0.79 \pm 0.05$ (sys)

$\varepsilon_{cosmic} = 0.93 \pm 0.03$ (sys)

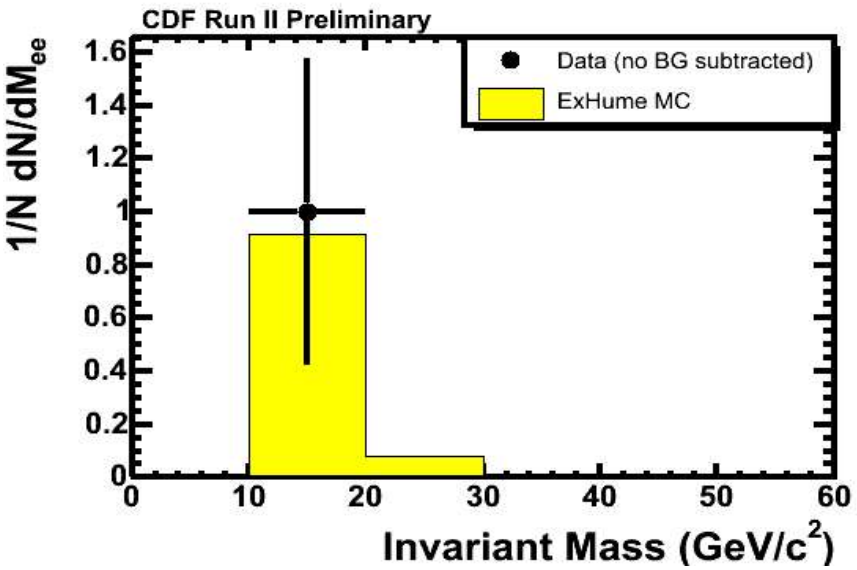
$\varepsilon_{ee} = 0.26 \pm 0.03$ (sys)

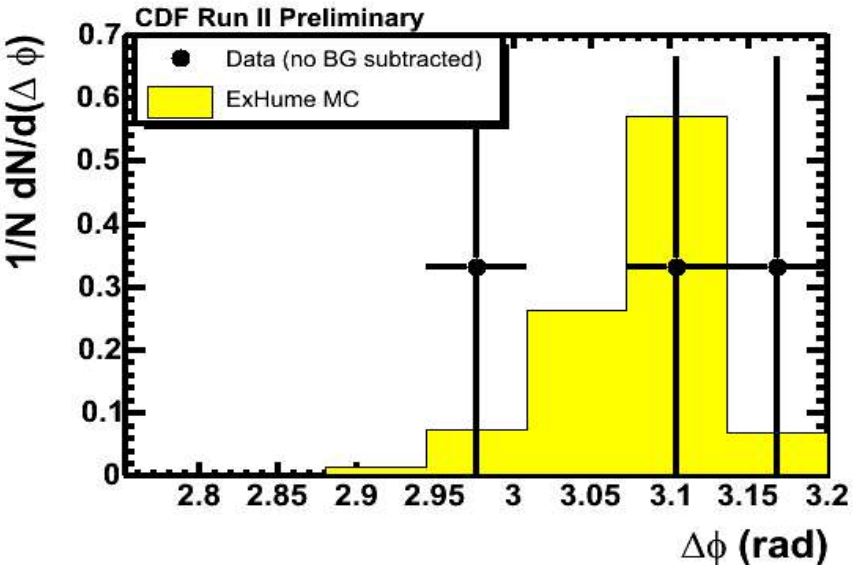
$$\sigma_{MEASURED} = 1.6\,^{+0.5}_{-0.3}\ (stat) \pm 0.3\ (sys)\ pb$$

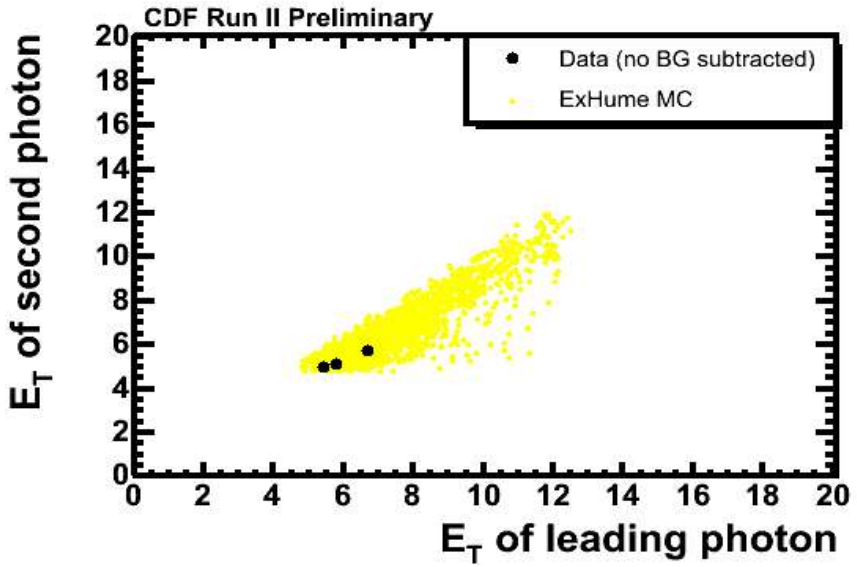
Poisson probability of 2.8 →16 = 5.0×10^{-8}
Corresponds to 5.4σ "observation"

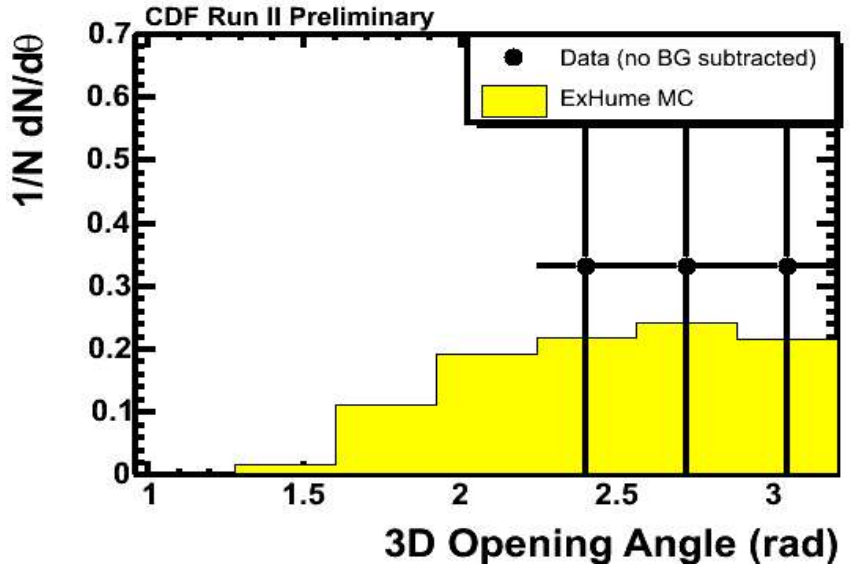
Agrees with LPAIR theory: $\sigma_{LPAIR} = 1.711 \pm 0.008$ pb

$\gamma\gamma$ comparison to ExHume MC

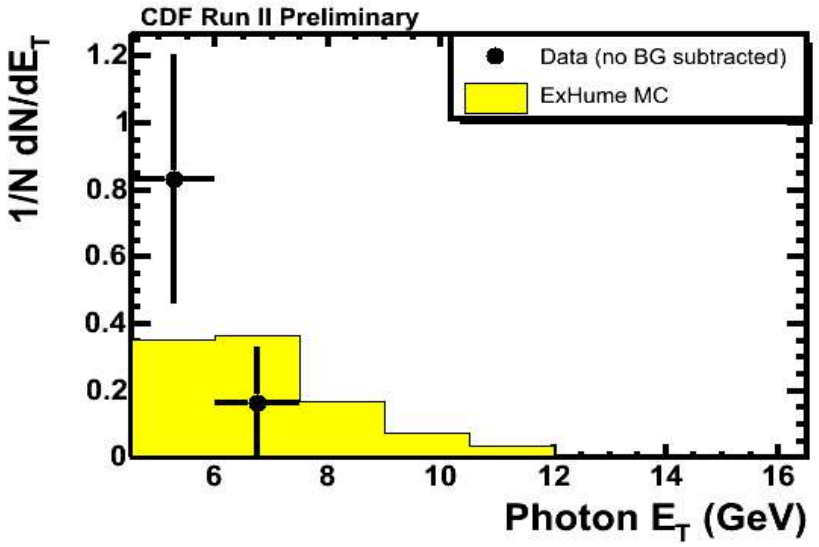


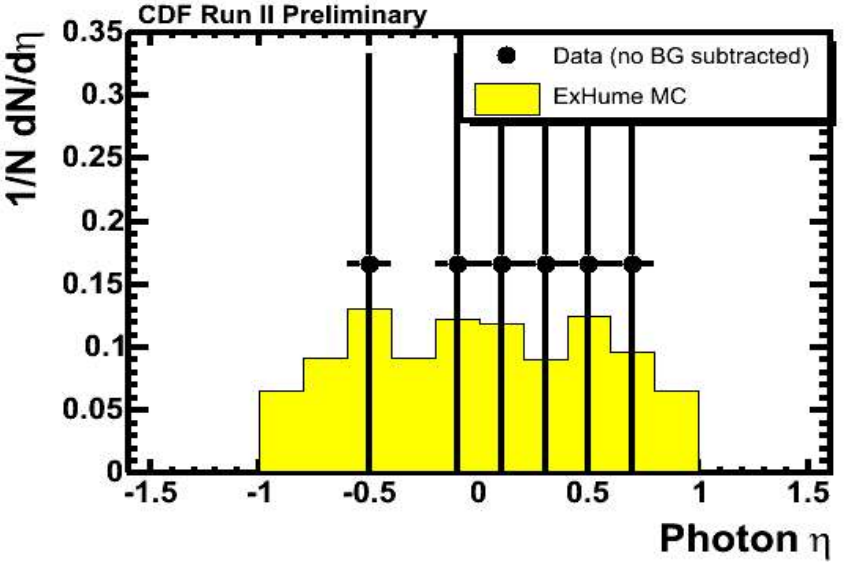


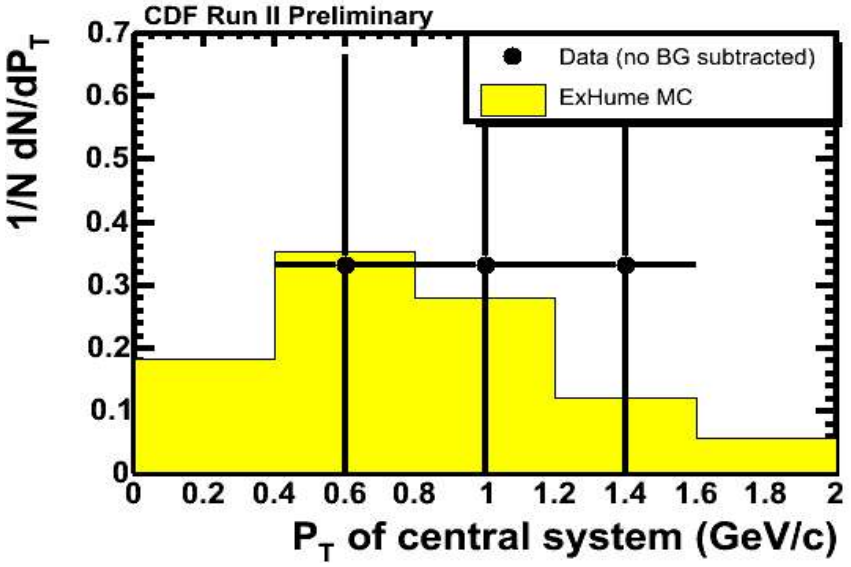


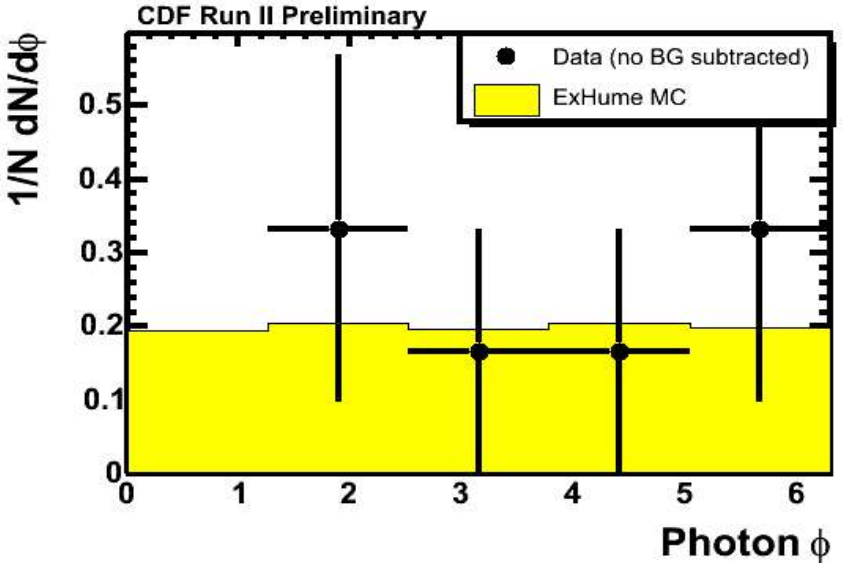


$\gamma\gamma$ comparison to ExHume MC



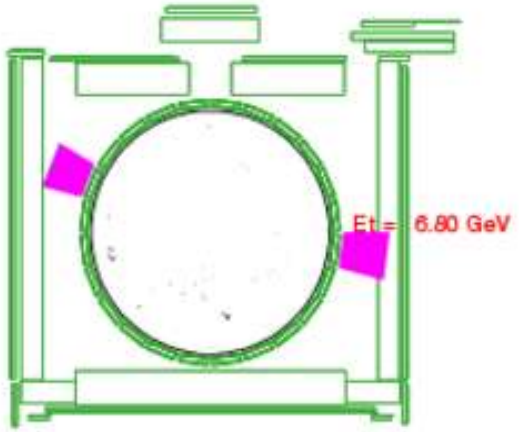


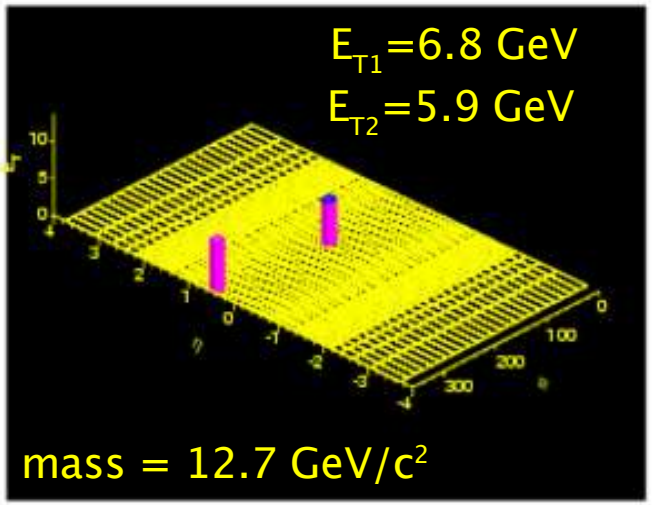


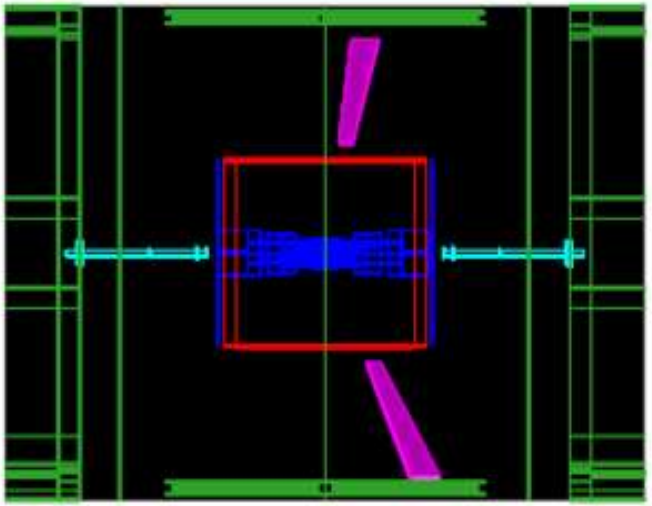


$\gamma\gamma$ Event Display (I)

Run: 191089 Event: 127812

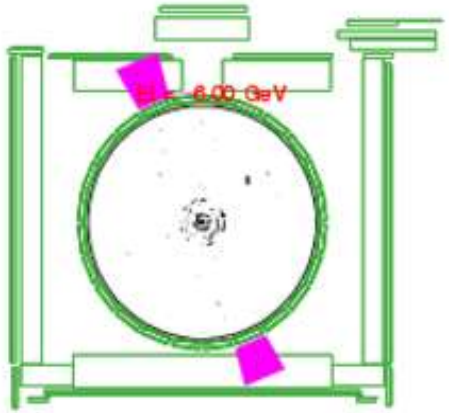


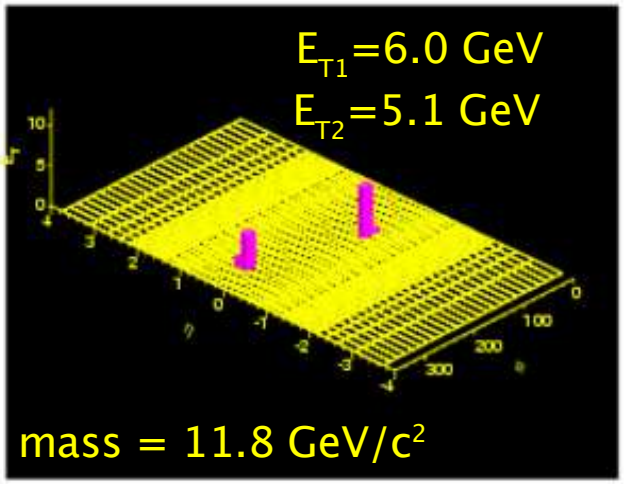


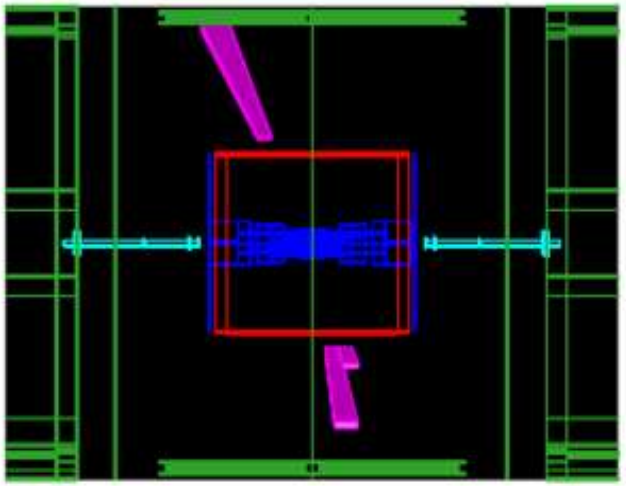


$\gamma\gamma$ Event Display (II)

Run: 199189 Event: 6276945

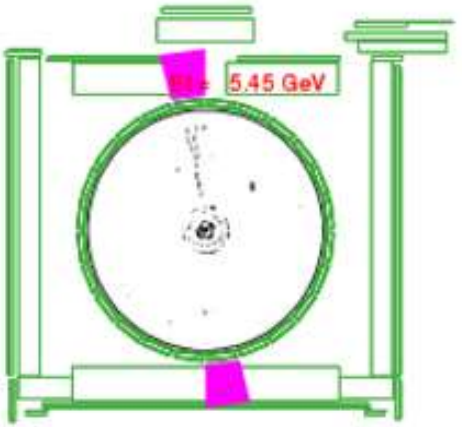


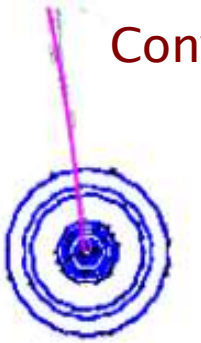


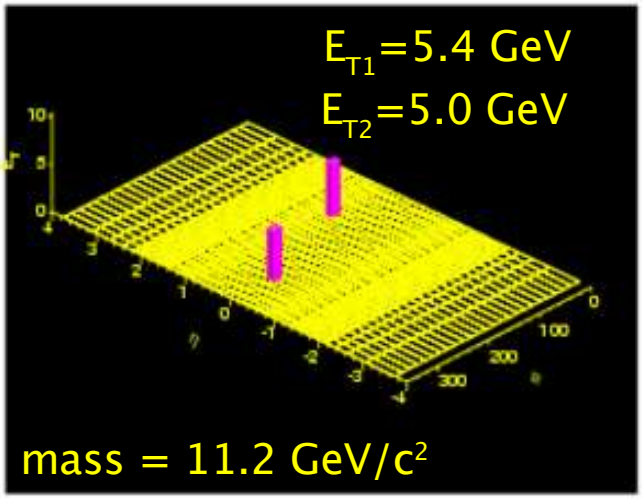


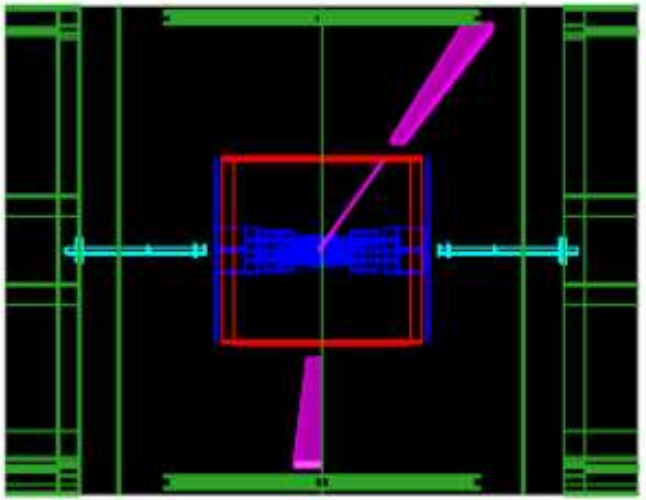
$\gamma\gamma$ Event Display (III)

Run: 200284 Event: 346775

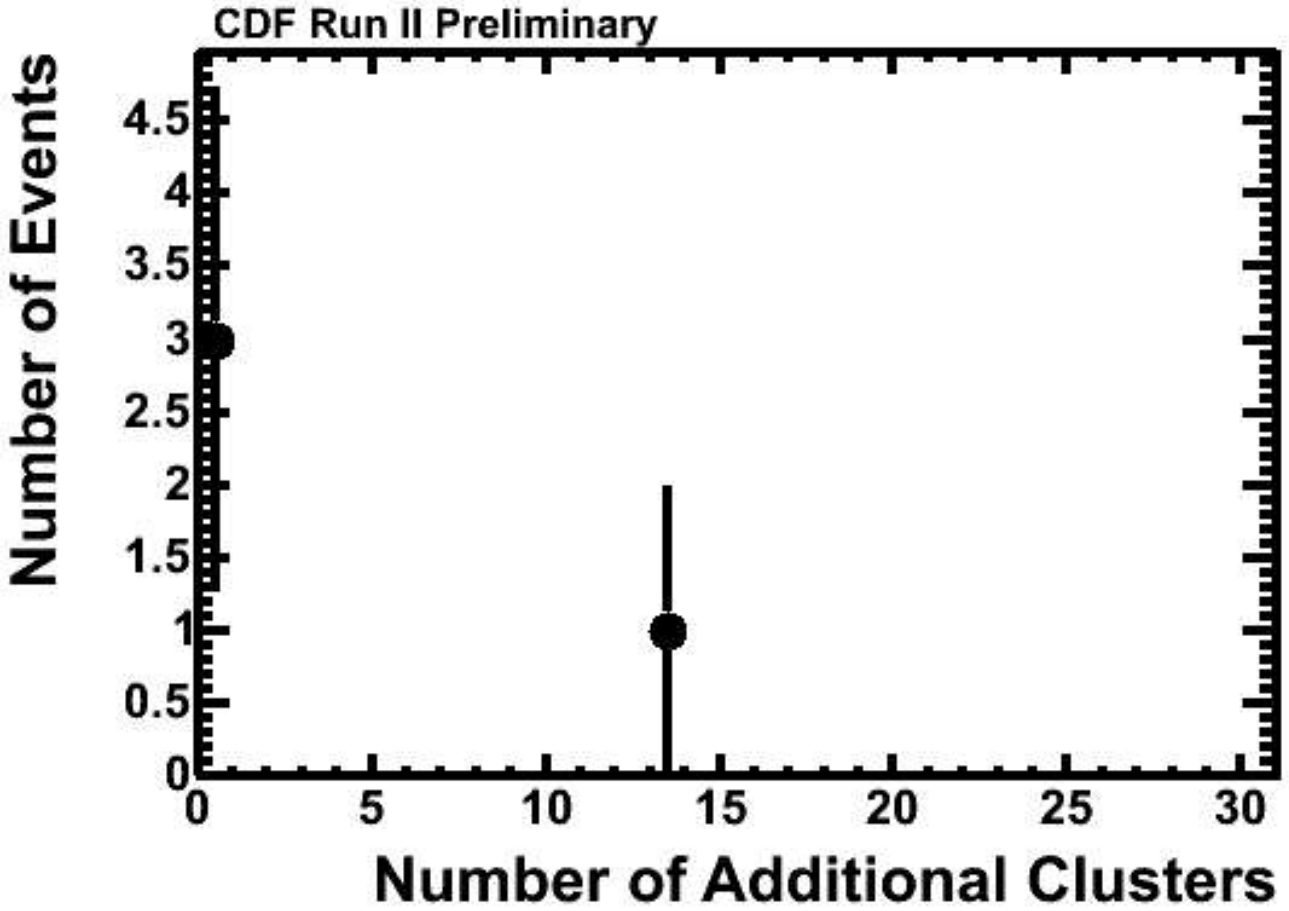








$\gamma\gamma$ Exclusivity Background



Background Numbers for $\gamma\gamma$

$\gamma\gamma$ Background Summary: The backgrounds are very small (and they are mostly upper limits) I use them as systematics on top of ***zero background***

Fakes:	$0.0^{+0.1}_{-0.0}$ events
Cosmic:	negligible
Exclusive:	$0.0^{+0.05}_{-0.00}$ events
Dissociation:	$0.0^{+0.05}_{-0.00}$ events
Total:	$\boldsymbol{0.0^{+0.2}_{-0.0}}$ ***events***

Cross Section Numbers for $\gamma\gamma$

$$\sigma = \frac{N_{candidates} - N_{background}}{\varepsilon_{cosmic}\,\varepsilon_{conv}\,\varepsilon_{\gamma\gamma}\,\mathcal{L}_{eff}}$$

$N_{candidates} = 3\ ^{+2.9}_{-0.9}$ (stat)

$N_{background} = 0\ ^{+0.2}_{-0.0}$ (sys)

$\mathcal{L}_{eff} = 46 \pm 3$ (sys) pb^{-1}

$\varepsilon_{conv} = 0.87 \pm 0.09$ (sys)

$\varepsilon_{\gamma\gamma} = 0.57 \pm 0.07$ (sys)

$\varepsilon_{cosmic} = 0.93 \pm 0.03$ (sys)

$$\sigma_{MEASURED} = 0.14\ ^{+0.14}_{-0.04}\ \text{(stat)} \pm 0.03\ \text{(sys)}\ \text{pb}$$

Poisson probability of 0.2 → 3 = 1.1×10^{-3}
Corresponds to 3.3σ "evidence"

Agrees with KMR theory: $\sigma_{KRM} = 0.04 \pm (\times 3\text{–}5)$ pb