

Central diffractive gamma-gamma production $pp \rightarrow p + \gamma\gamma + p$ Simulation with EDDE 1.2 and FAMOS 1.4.0

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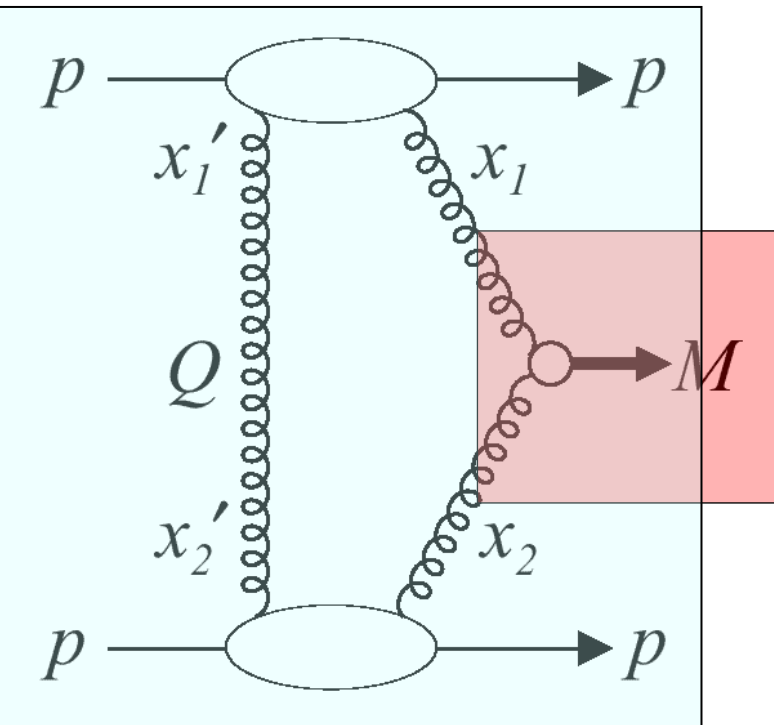
Motivations

Double Diffractive central production

exclusive

$$pp \rightarrow p + M + p$$

$$M \Rightarrow \{Higgs, jj, \gamma\gamma, \dots\}$$



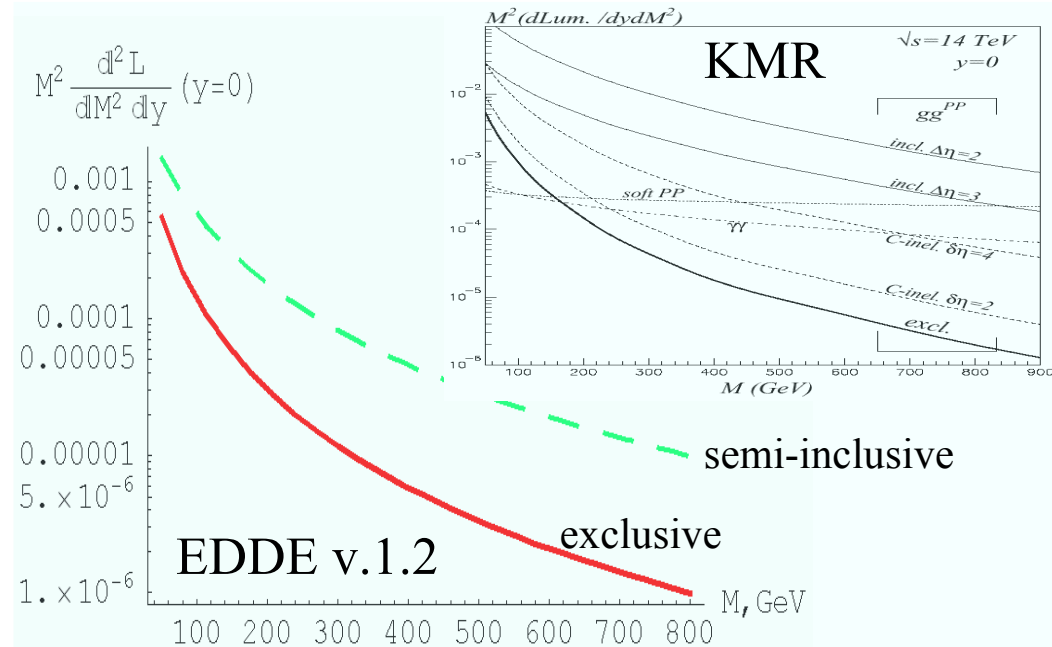
semi-inclusive

$$pp \rightarrow p + X + M + Y + p$$

$$\sigma = L(M^2, y) \hat{\sigma}(M^2)$$

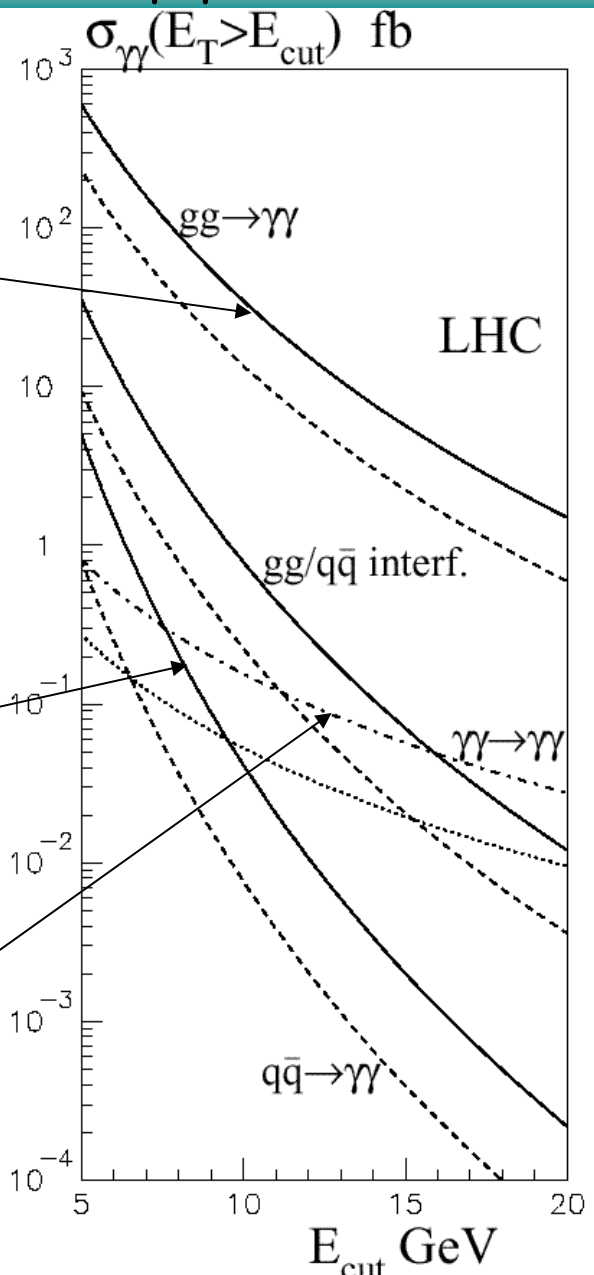
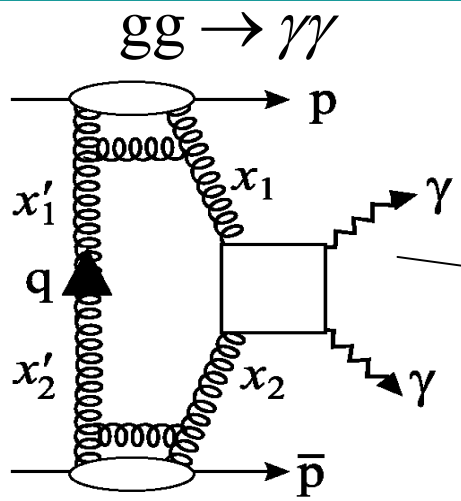
Effective luminosity
at rapidity y

Cross section for
the hard subprocess

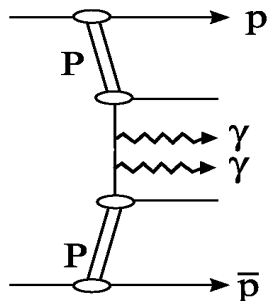


$$pp \rightarrow p \gamma\gamma p$$

$\sigma(pp \rightarrow p \gamma\gamma p)_{ \eta_\gamma < 2}$	$E_T^\gamma \text{ min}$
600 fb	5 GeV
40 fb	10 GeV
6 fb	15 GeV



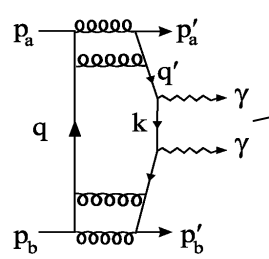
$\gamma\gamma + \text{hadrons}$



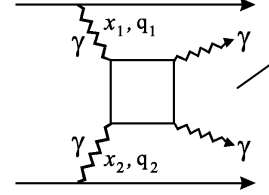
$$\frac{\sigma(pp \rightarrow p (\gamma\gamma + \text{hadrons}) p)}{\sigma(pp \rightarrow p \gamma\gamma p)} \sim \text{several tens}$$

(from POMWIG)

$qq \rightarrow \gamma\gamma$



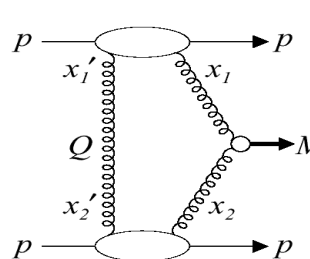
$\gamma\gamma \rightarrow \gamma\gamma$



ExHuMe (hep-ph/0502077) is based on KMR calculations

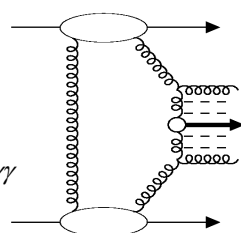
EDDE v.1.2 (hep-ph/0409180) is based on P&R calculations

exclusive
 $pp \rightarrow p \gamma \gamma p$

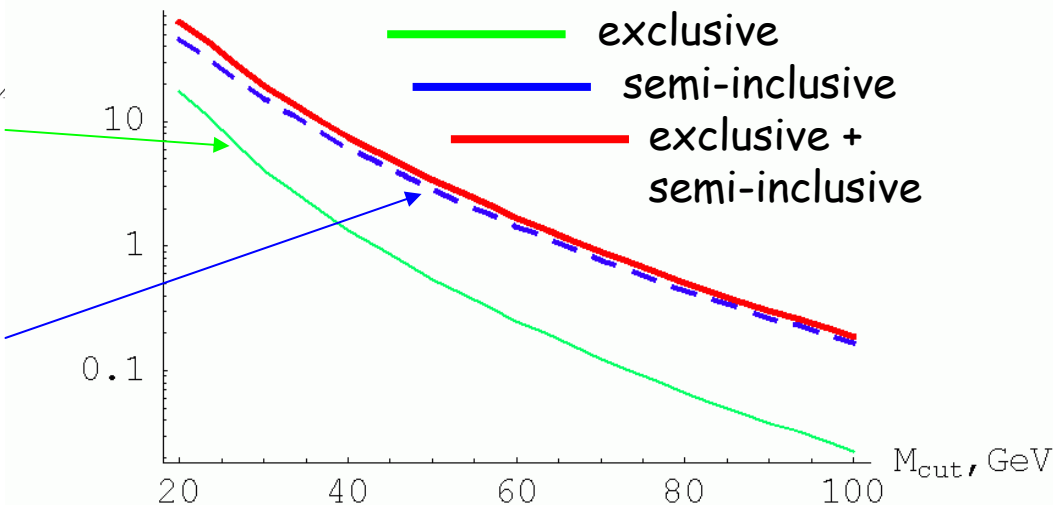


$\sigma(M_{\gamma\gamma} > M_{\text{cut}}), \text{ fb}$

semi-inclusive
 $pp \rightarrow p (\gamma\gamma + \text{soft hadrons}) p$

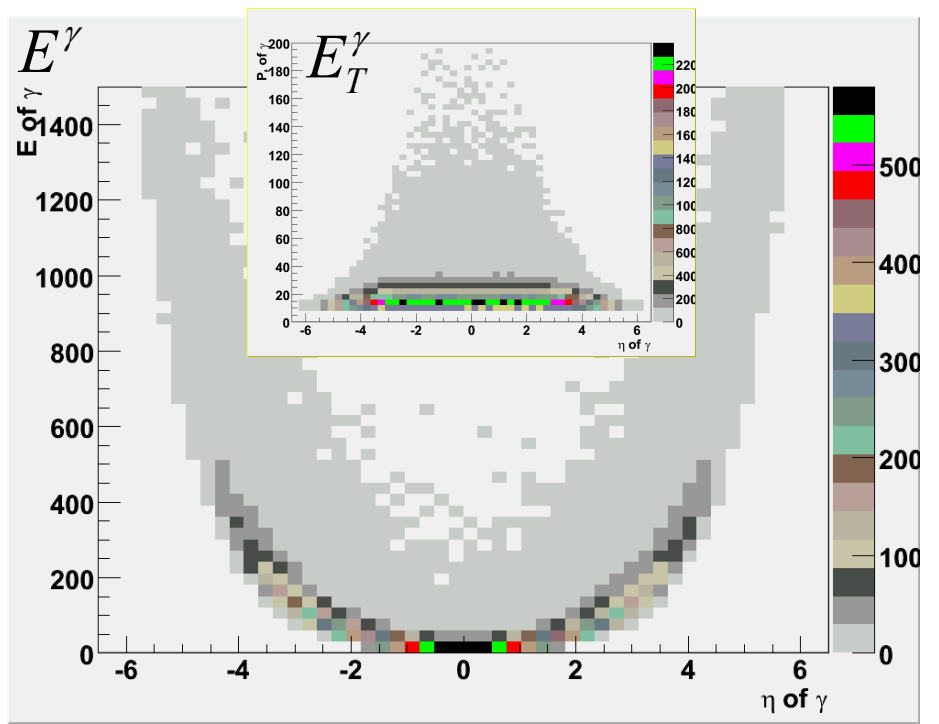
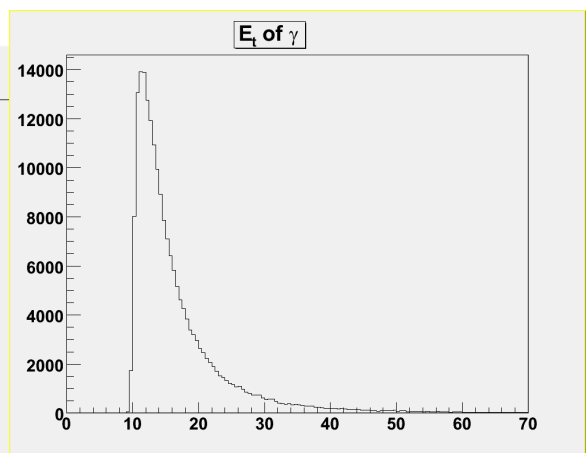
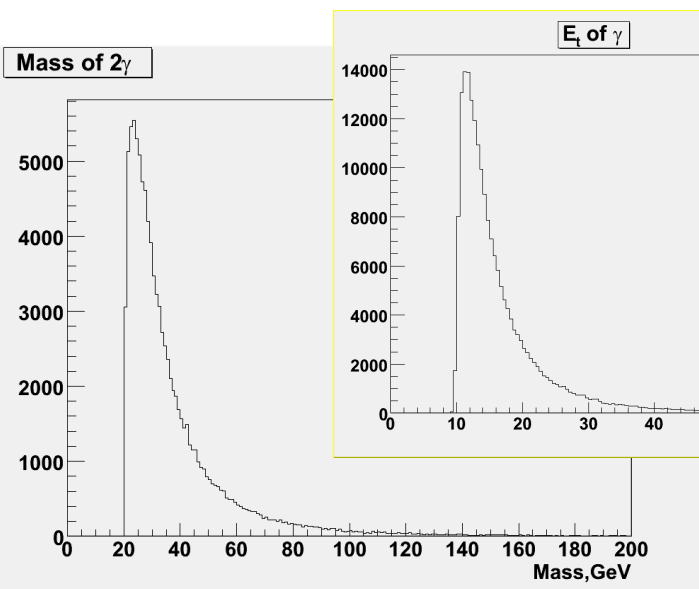
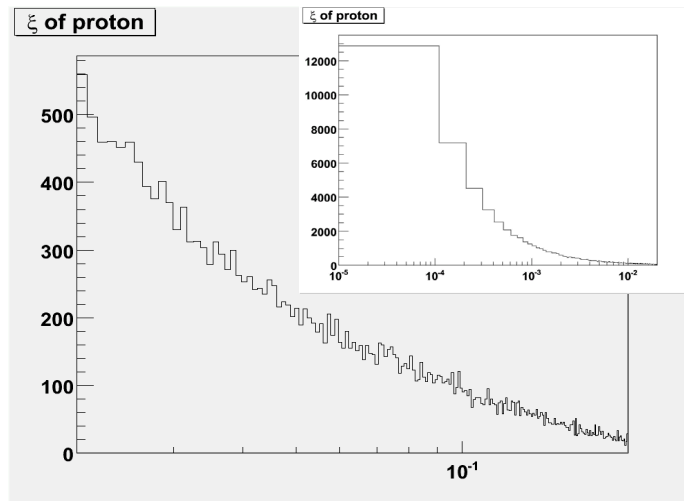
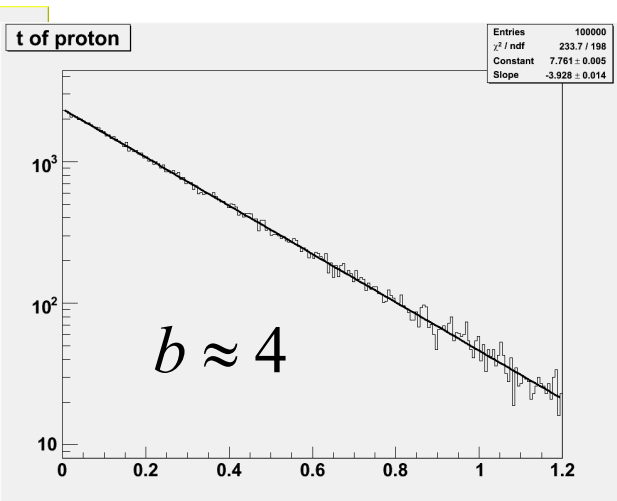
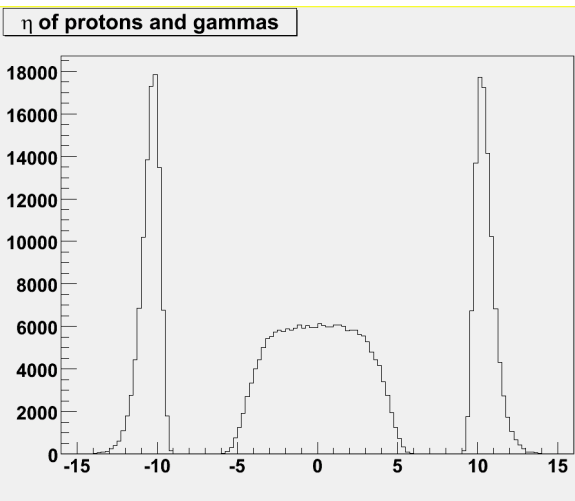


"soft hadrons" $\Leftrightarrow M_{\text{hadrons}} \ll M_{\gamma\gamma}$



Cross sections for $\gamma\gamma$ production at LHC energy, in fb, calculated in $\eta < 2$

$M_{\text{cut}}, \text{ GeV}$	KMR exclusive	EDDE exclusive	EDDE semi-inclusive	EDDE total
20	40	18	46	64
30	6	4	15	19
40	1.8	1.3	6	7.3

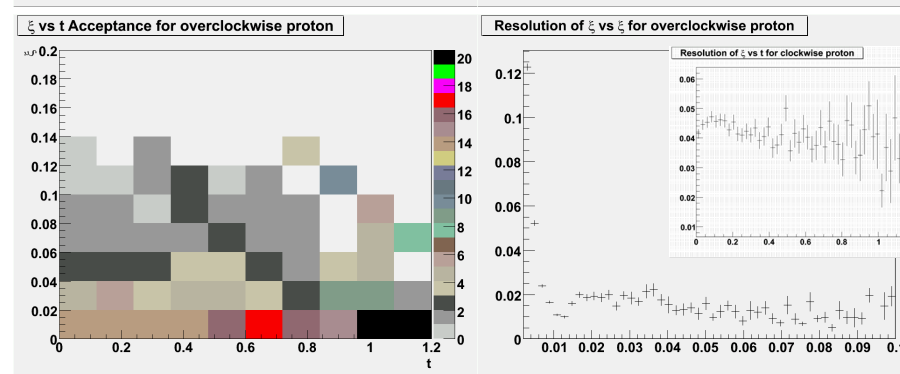
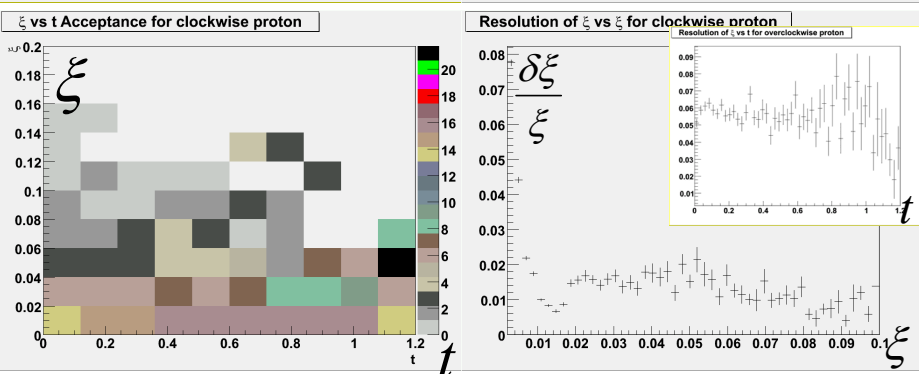
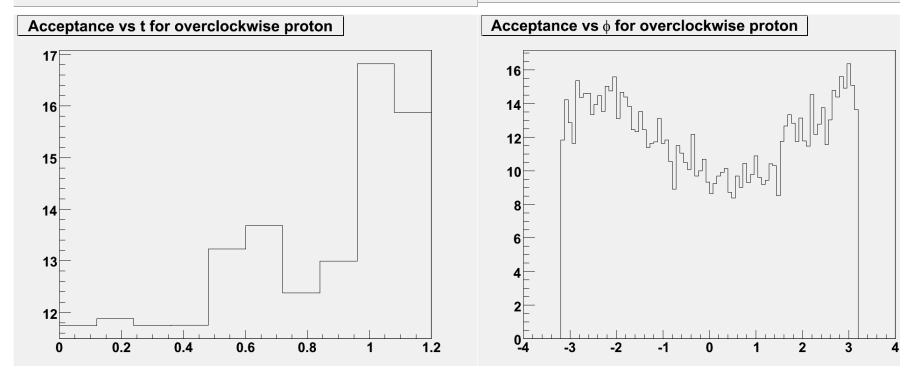
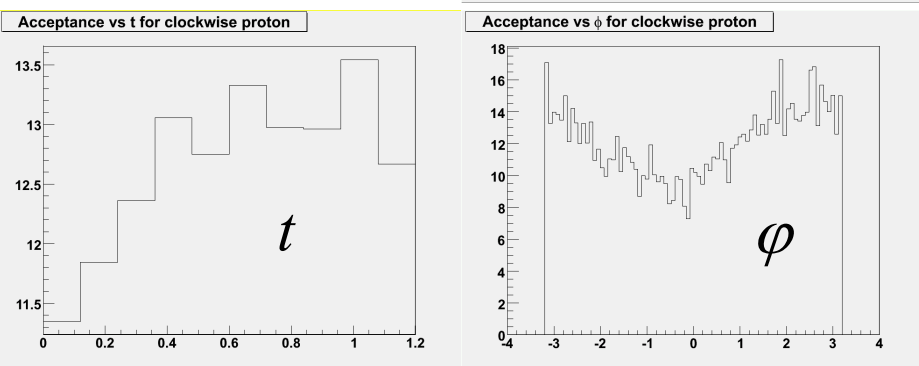
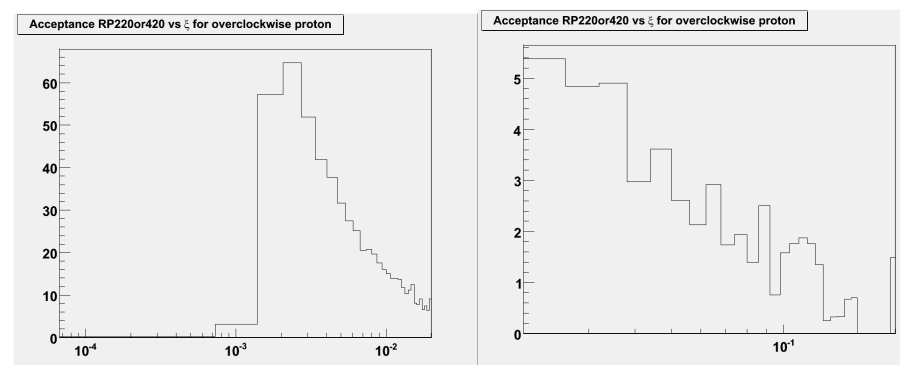
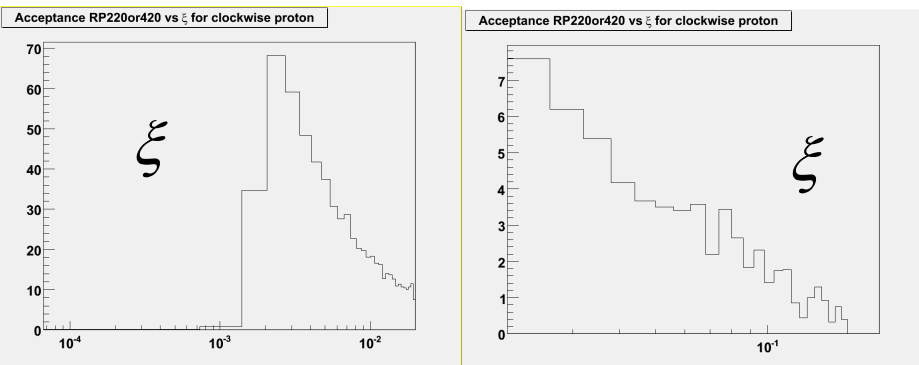


RP acceptance and resolution

All plots calculated for diffractive protons produced in $pp \rightarrow p\gamma p$ reaction (EDDE v.1.2)
 It is required that both protons should be detected by RP220 or RP420

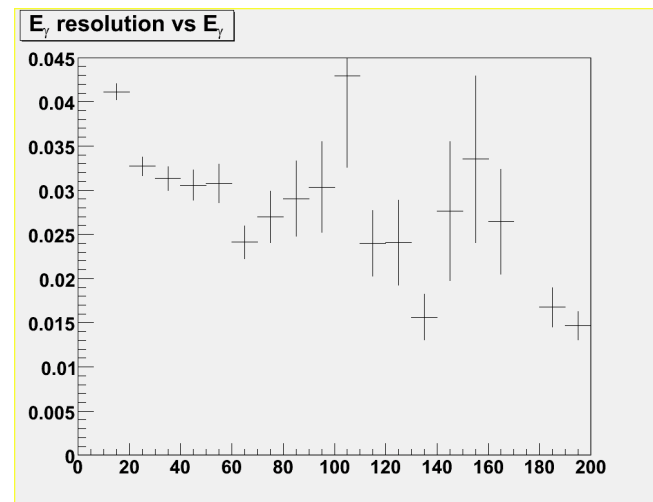
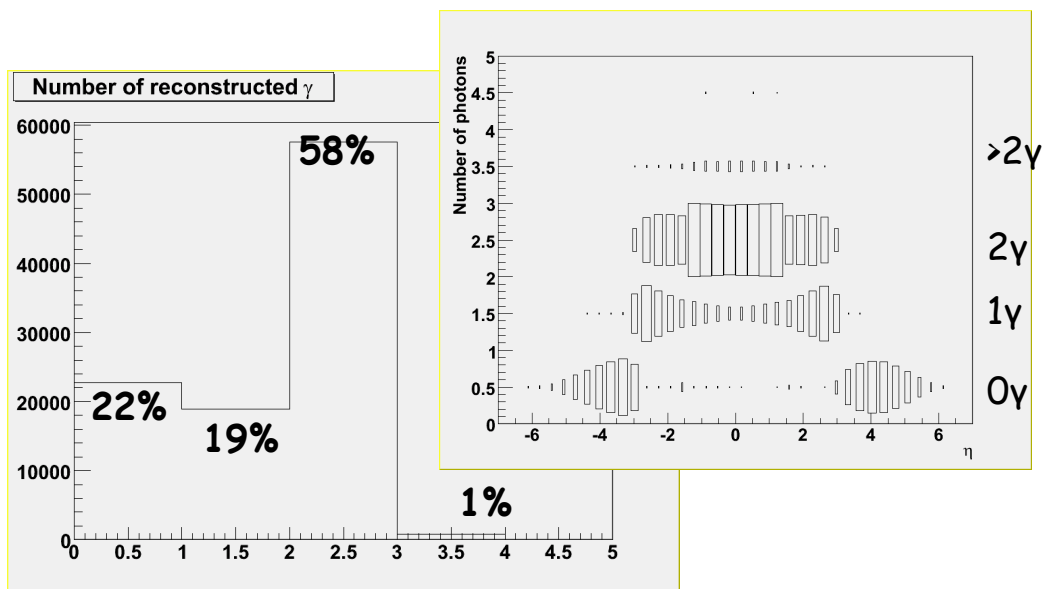
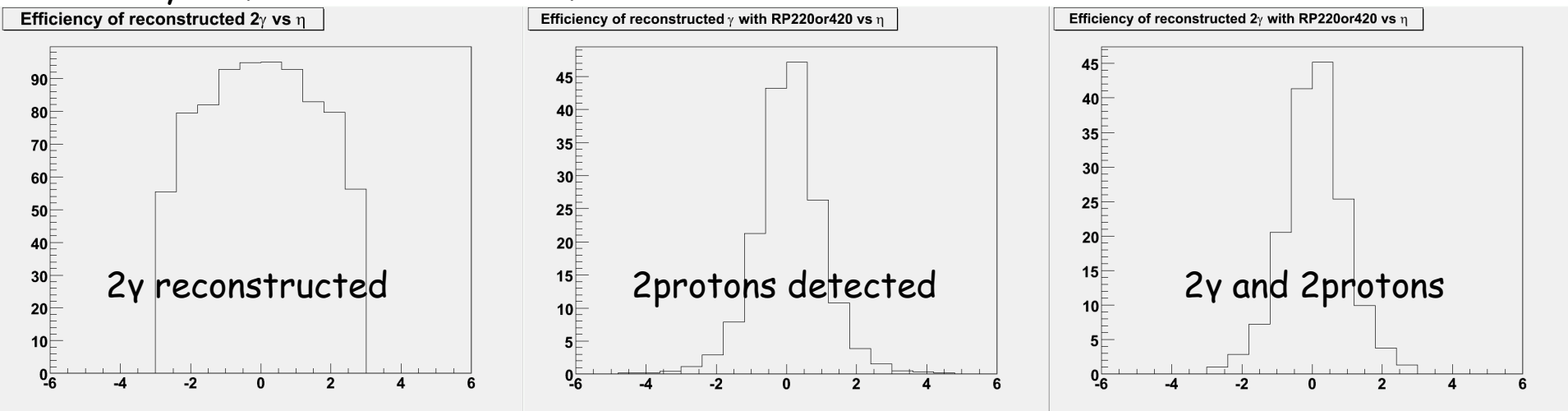
clockwise

anticlockwise



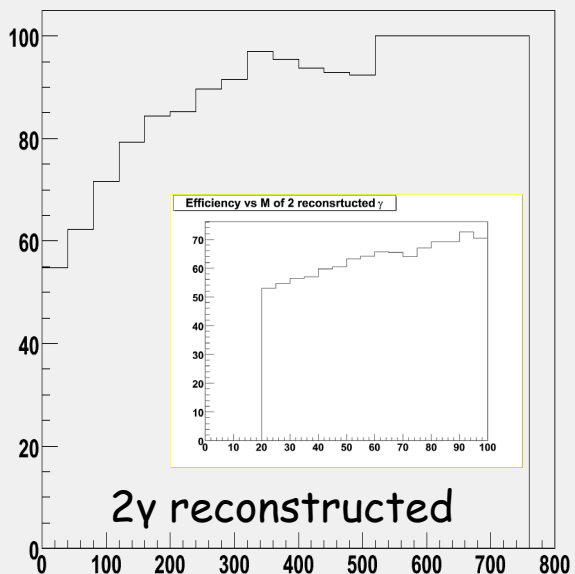
Gamma reconstruction

Efficiency of γ measurements vs η_γ at different conditions:

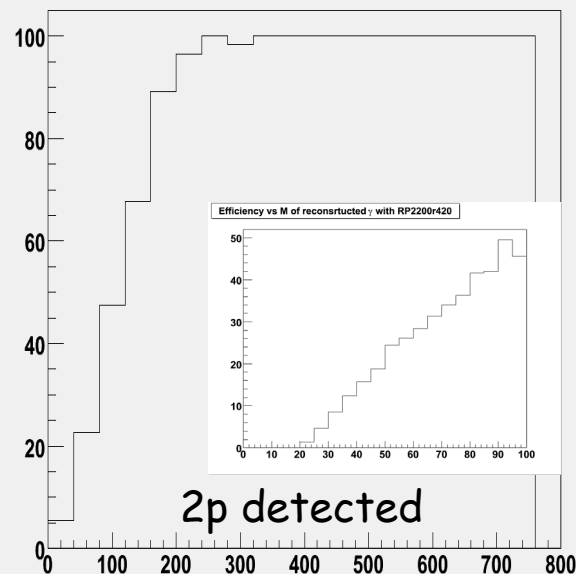


Central mass acceptance and resolution

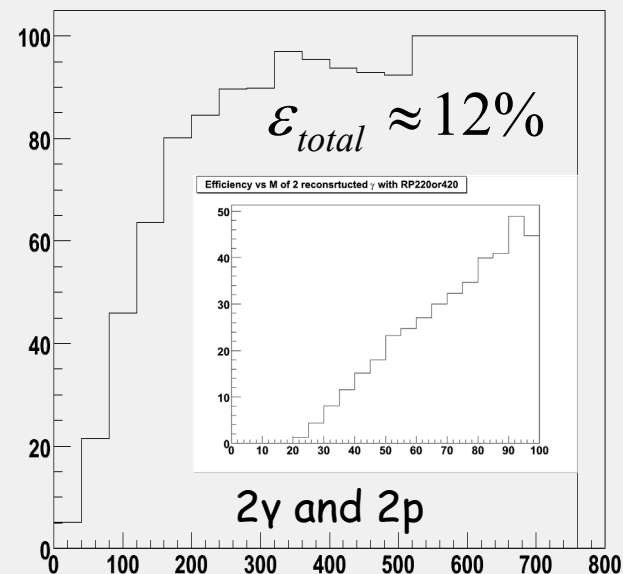
Efficiency vs M of 2 reconstructed γ



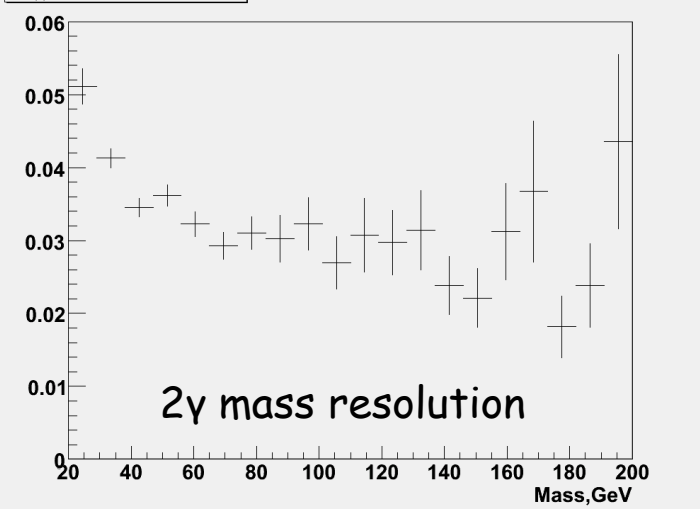
Efficiency vs M of reconstructed γ with RP2200r420



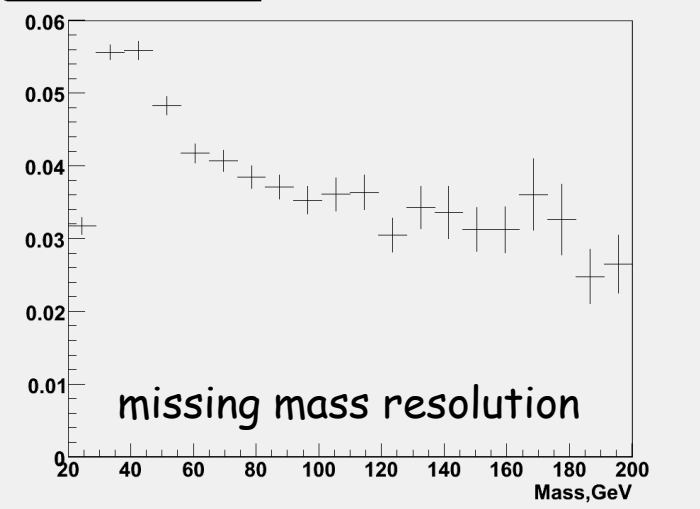
Efficiency vs M of 2 reconstructed γ with RP2200r420



$M_{\gamma\gamma}$ resolution vs M



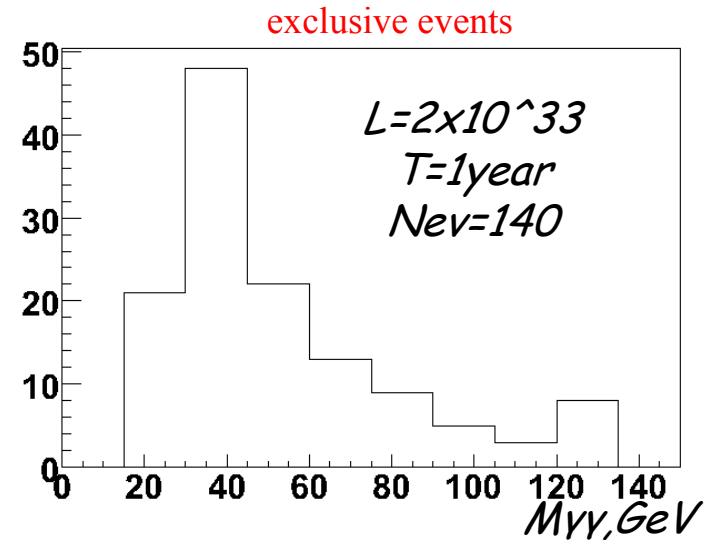
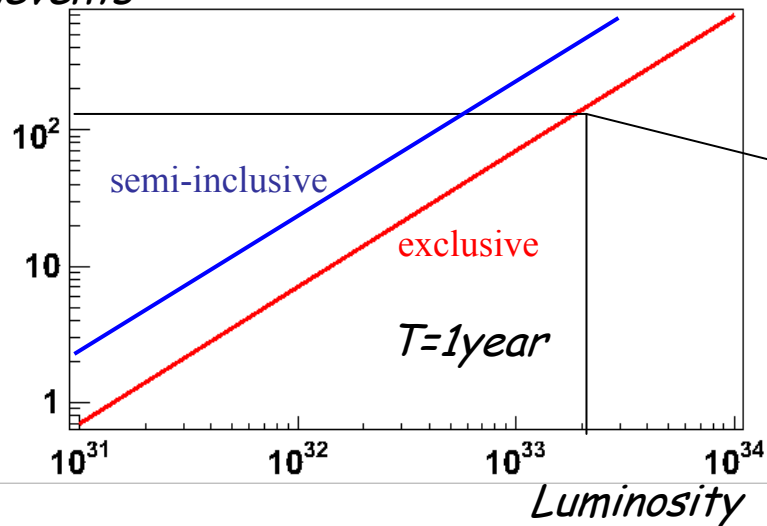
M_{mis} resolution vs M



Some preliminary conclusions

With known cross section (EDDE) and efficiency of registration for the reaction $pp \rightarrow p2\gamma p$ one can estimate Number of events vs Luminosity

N_{events}



- Semi-inclusive process with soft hadrons enlarges data by ~ 3.6 times
- Regge-eikonal approach allows to extract factorized Luminosity as from exclusive as from semi-inclusive data
- no difference which type of central mass is produced in the reactions

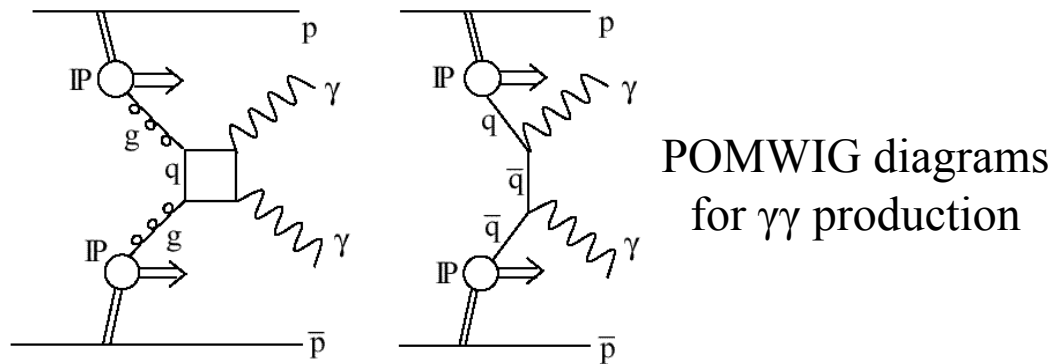
may be jet-jet double diffractive production (which cross section is higher by several orders) is better for our task?

Prospects for the future



Prospects for the future

- Study and compare 3 generators simulating gamma-gamma production
 - EDDE exclusive and semi-inclusive (v.2.1 in preparation)
 - ExHuMe exclusive
 - POMWIG semi-inclusive



- Include to the simulations semi-inclusive gamma-gamma production
- Study pile-up influence
- Study L1 and HLT trigger efficiencies for gamma-gamma production