

# $H \rightarrow \gamma\gamma$ : Effect on $\gamma$ Energy Resolution over Significance

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## Status: Work in progress

- Scope: target is  $v\bar{v}H$  ( $H \rightarrow \gamma\gamma$ ) at 500 GeV. Main background only ( $v\bar{v}aa$ ).
- Procedure is clear but study very preliminary yet.
- Still developing code.

## Procedure

- Assuming several photon resolutions worst that the observed one.
- For each resolution the significance of the signal over the main background is obtained.
  - Same cut flow as showed in LCWS13.
  - Signal window needs reoptimisation (peak gets broader).
  - BDT maybe too.

## Plan

- Show this study in the incoming ILD meeting.
- Cover Ogawa san calorimeter study.

- $F_o$  is observed single  $\gamma$  E res.
- Generate new  $\gamma$  E ( $E_r$ ) using gaussian.
- $F_c$  is the  $\gamma$  E resolution with those  $E_r$ .
- Apply same selection cut and extract significance: signal / sqrt( signal + back )

### Observed $\gamma$ E res

$$F_o = ( E - E_{mc} ) / E_{mc}$$

### Extracted $E_r$

$$F_r = ( E_r - E ) / E$$

$$frand = Fr(RAND)$$

$$E_r = frand * E + E$$

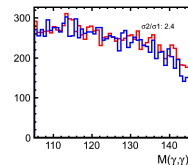
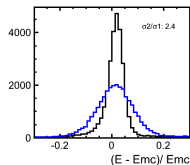
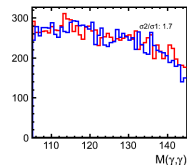
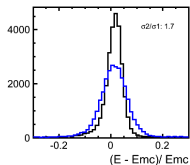
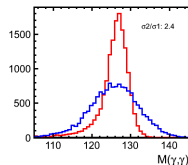
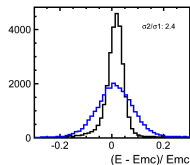
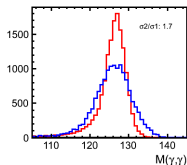
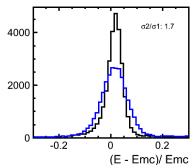
### New $\gamma$ E resolution

$$F_c = ( E_r - E_{mc} ) / E_{mc}$$

## What we expect

- Expect the background not very sensitive to the E res.
- In the other hand, signal will be (peak get broader).
- Broader peak  $\rightarrow$  broader signal window  $\rightarrow$  more background  $\rightarrow$  significance get worse.

# Examples



- E res sigma 1.7 times the observed value.
- vvH( up ) vva ( down )

- E res sigma 2.4 times the observed value.
- vvH( up ) vva ( down )

