

# Combination Measurement of CEPC $\mu$ uncertainty

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# Target

- Repeat Jin's work, combine 13 subchannels to workspace, build pdf and Asimov Data;
- Calculate the uncertainty of signal strength;
- Prepare analysis with updated data;

# Production modes & bkg modes

| Signal   |                | Bkg from                                | abbr. |
|----------|----------------|-----------------------------------------|-------|
| Z        | H              |                                         |       |
| ee       | bb             | fake ZH<br>ZZ                           | eebb  |
|          | cc             |                                         | eecc  |
|          | gg             |                                         | eegg  |
| $\mu\mu$ | bb             | fake ZH<br>ZZ                           | mmbb  |
|          | cc             |                                         | mmcc  |
|          | gg             |                                         | mmgg  |
| qq       | bb             | 1. fake ZH<br>2. ZZ<br>3. WW<br>4. WWZZ | qqbb  |
|          | cc             |                                         | qqcc  |
|          | gg             |                                         | qqgg  |
| ll       | $\gamma\gamma$ | $\gamma\gamma$                          | llaa  |
| vv       |                |                                         | nnaa  |
| qq       |                |                                         | qqaa  |
| vv       | ZZ             | fake ZH<br>ZZ                           | vvzz  |

Data from Jin:  
Need update;

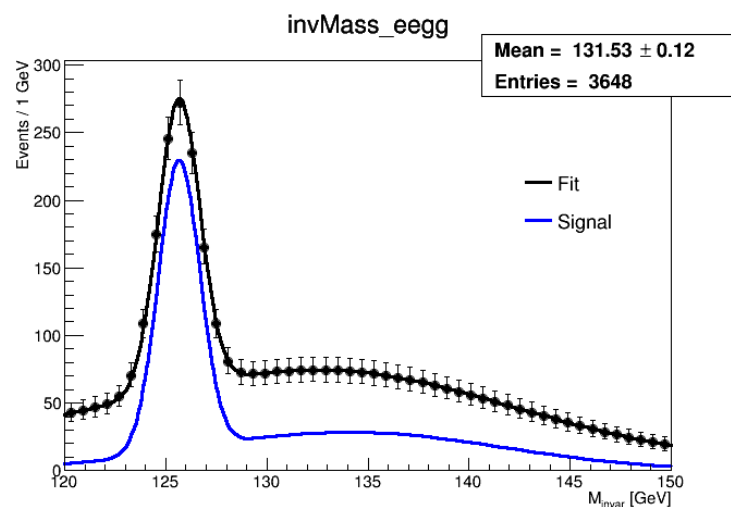
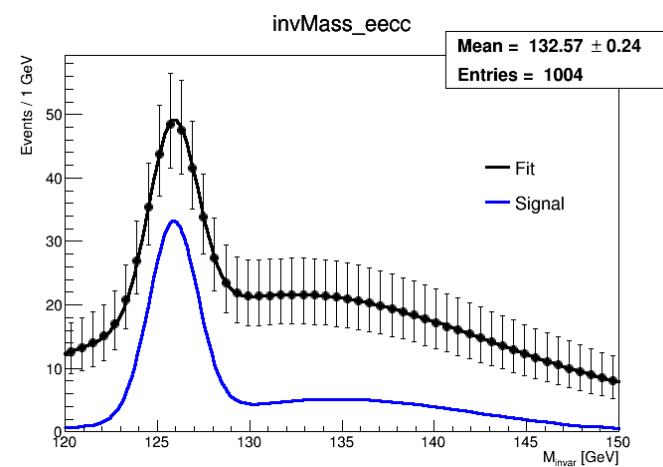
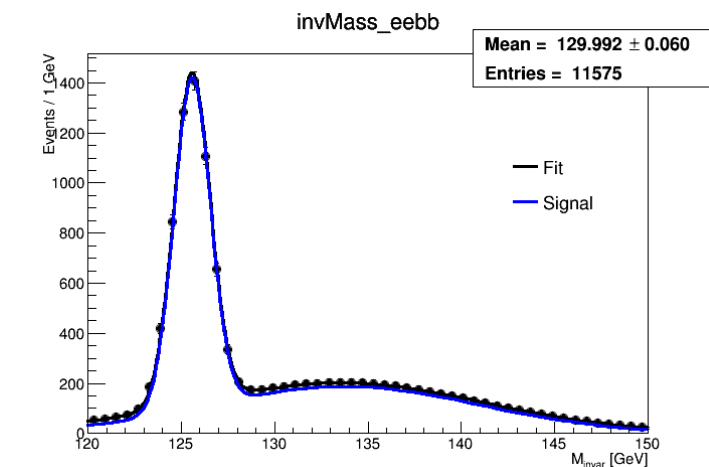
# Workspace Combination

- For each subchannel, Hmass and weight stored by ntuple are converted.
- No correlation yet;
  - NP's uncertainty not included;
  - Pdf build
  - Signal: peak: CB; tail: Gaussian;
  - Bkg: 2 order polynomial exp,  $e^{p_0 * \frac{h-100}{100} + p_1 * \left(\frac{h-100}{100}\right)^2}$
  - Combine: `modelSB_eebb[ nsig_eebb * signalPdf_eebb + nzz_eebb * zzPdf_eebb + nzh_eebb * zhPdf_eebb ]`
- Make AsimovData
  - Using combined pdf to create data bins by bins in range; `npoints=500;`
  - $\text{POI}(\mu, \mu_{bb}, \mu_{cc}, \mu_{gg}, \mu_{JJ}, \mu_{zz}, \mu_{aa})$  are recorded;

little difference when  
changing npoints;

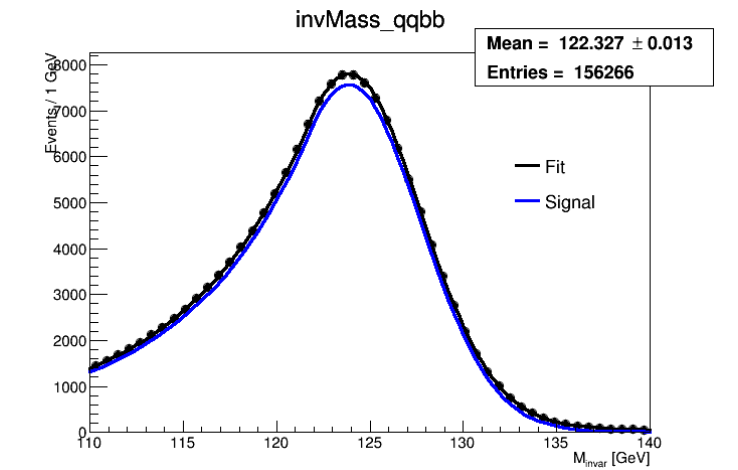
# Plot show for each channel

Signal pdf and  
Combined(S+B)  
pdf are  
presented

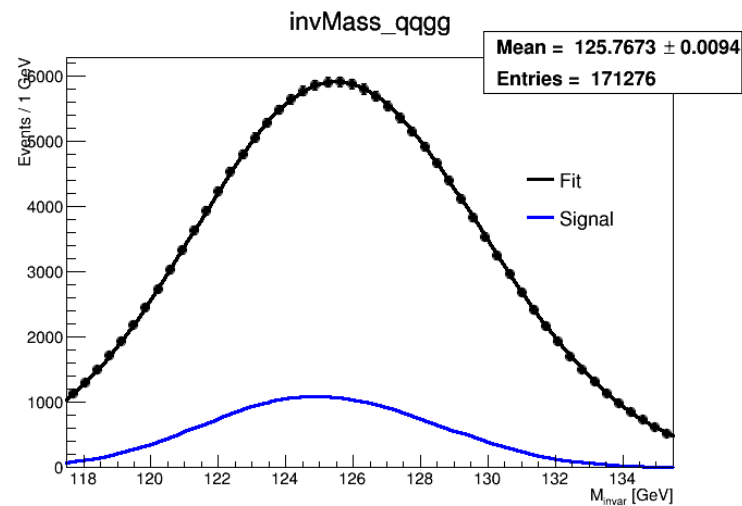
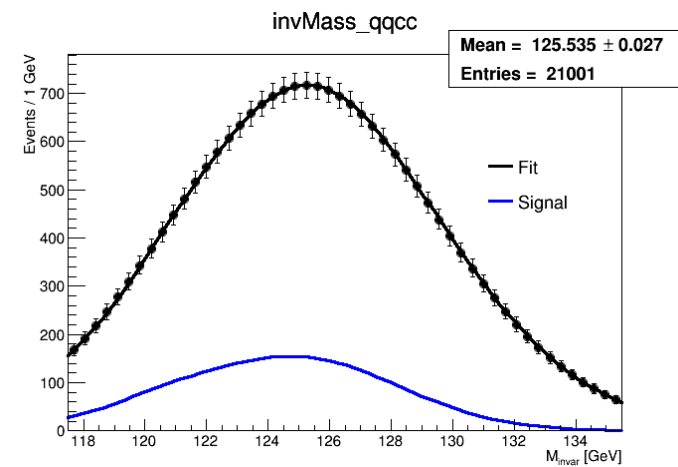


Plots in afternoon's report some  
data dots are jumping out;  
Binning issue; fixed.

# Plot show for each channel

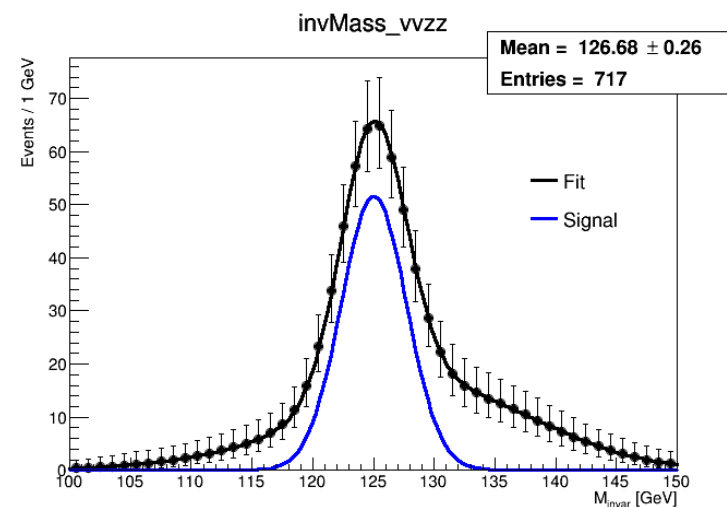
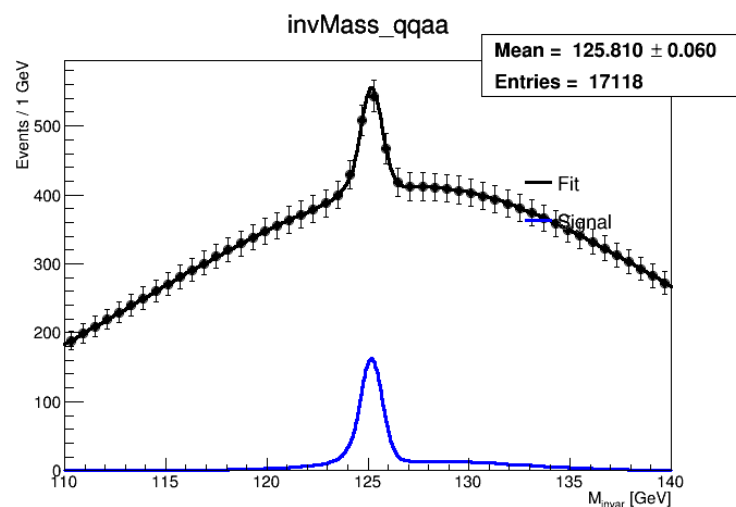
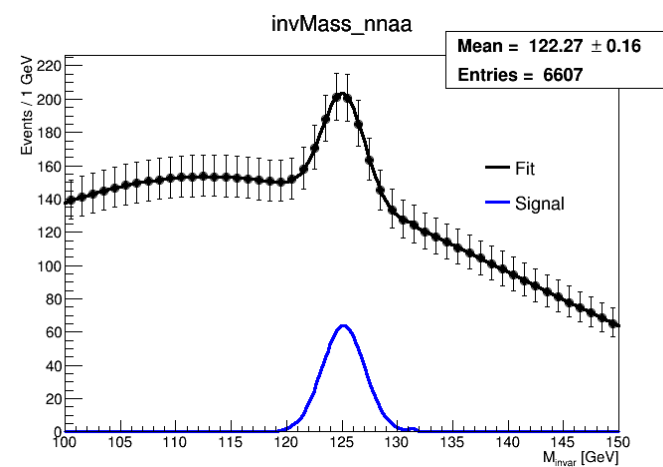
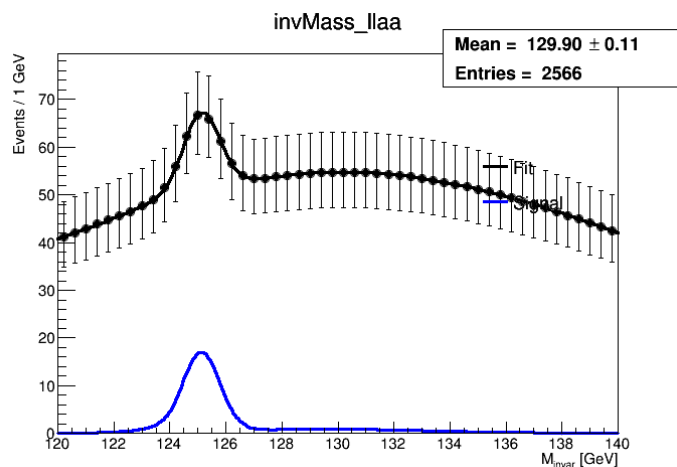


constraint



# Plot show for each channel

Total events:  
406830



# Fit $\mu$ uncertainty

- Set other  $\mu$  to constant then fit;

| Fit type   | $\mu$  | $\mu_{bb}$ | $\mu_{cc}$ | $\mu_{gg}$ | $\mu_{zz}$ | $\mu_{aa}$ |
|------------|--------|------------|------------|------------|------------|------------|
| Global     | 0.556% |            |            |            |            |            |
| Subchannel |        | 0.558%     | 3.083%     | 1.339%     | 6.472%     | 7.475%     |

# Further Plan

- Update data、 channels
- Fit coupling constraint