CEPC HZZ Analysis Update

Min Zhong, Yanxi Gu

2020.7.21

Part 1. BDT Fitting Results

- **Add “2D cut” to the several pre-BDT cuts**
- **Fitting results for BDT analysis (2D cuts applied)**
- **Same fitting procedure as before (one signal pdf for each channel, other signal events remained are remained still regarded as background)**

Part 1. BDT Fitting Results

➢ Comparisons

➢ Unit: %

Channel	Cut-based	Cut-based (2D cuts applied)	BDT	BDT (2D cuts applied)
$\mu\mu Hvvjj$	**18.15**	**17.40**	**15.80**	**14.76**
$\mu\mu Hjjvv$	**65.25**	**63.13**	**58.16**	**56.28**
$vvH\mu\mu jj$	**13.45**	**13.04**	**13.06**	**12.77**
$vvHjj\mu\mu$	**27.83**	**28.41**	**23.61**	**24.32**
$qqHvv\mu\mu$	**54.26**	**57.26**	**45.15**	**43.78**
$qqH\mu\mu vv$	**63.93**	**64.04**	**46.08**	**41.27**
Combined	**9.68**	**9.44**	**8.80**	**8.50**

Part 2. Other Higgs Channels

- **Set other Higgs process as floating**
- **Same fitting procedure as before (one signal pdf for each channel, other signal events remained are remained still regarded as background)**
- **Cut-based Remained Background Summarization**

name	scale	final
H_bb	0.21896	581
H_cc	0.011032	6
H_e3e3	0.023968	228
H_gg	0.0326888819557	1
H_ww	0.08176	223
H_zz	0.010024	61

- **BDT Remained Background Summarization**

name	scale	final
H_bb	0.21896	588
H_cc	0.011032	6
H_e3e3	0.023968	116
H_gg	0.0326888819557	1
H_ww	0.08176	472
H_zz	0.010024	46

- **Floating: signal, bb, e3e3, ww, zz**

Part 2. Other Higgs Channels

➢ Results

➢ Cut-based results

Parameter	Only signal floating	Signal & other Higgs floating
mu_s	**9.44**	**13.13**
mu_zz		**71.13**
mu_ww		**23.69**
mu_ττ		**16.65**
mu_bb		**15.65**

➢ BDT results

Parameter	Only signal floating	Signal & other Higgs floating
mu_s	**8.50**	**10.43**
mu_zz		**69.72**
mu_ww		**36.03**
mu_ττ		**22.27**
mu_bb		**22.33**

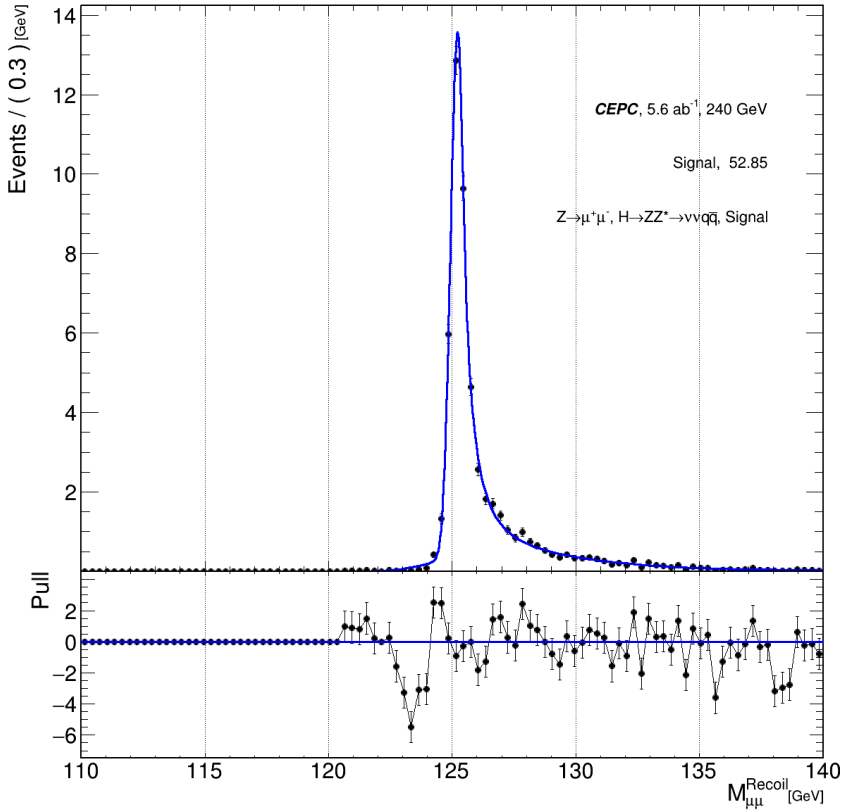
Part 3. Multiple Signal P.d.f.s

- **For each channel, use the signal events to construct a pdf, and use another pdf to describe the other channels' events that passed the same selections**
- **For example, for $\mu\mu Hvvjj$ channel, nnHzz and qqHzz (if not zero) "backgrounds" remained are merged together**
- **The two pdfs both contribute to the final signal precision**

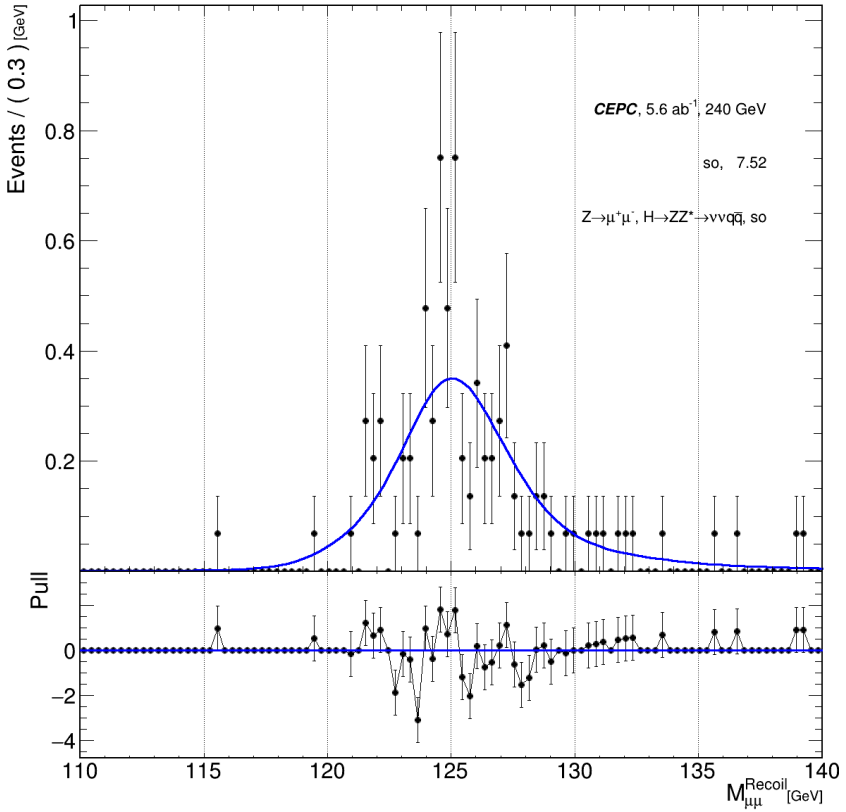
Part 3. Multiple Signal P.d.f.s

➢ Pdf construction

➢ *μμHvvjj* channel (cut-based)



➢ mzvj signal

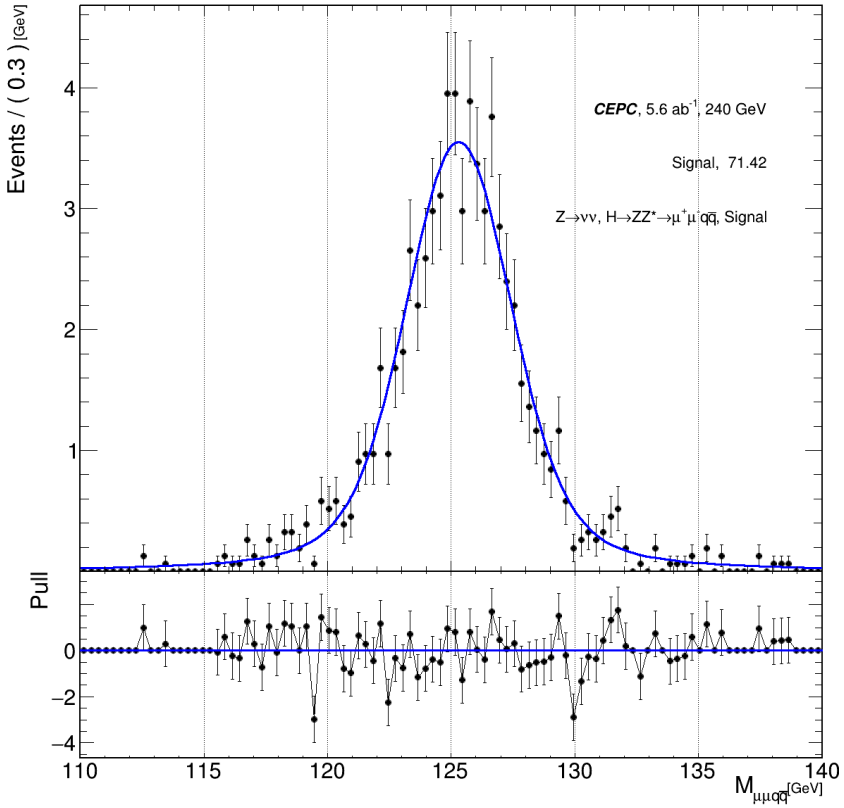


➢ mzvj signal other (qqHzz + nnHzz)

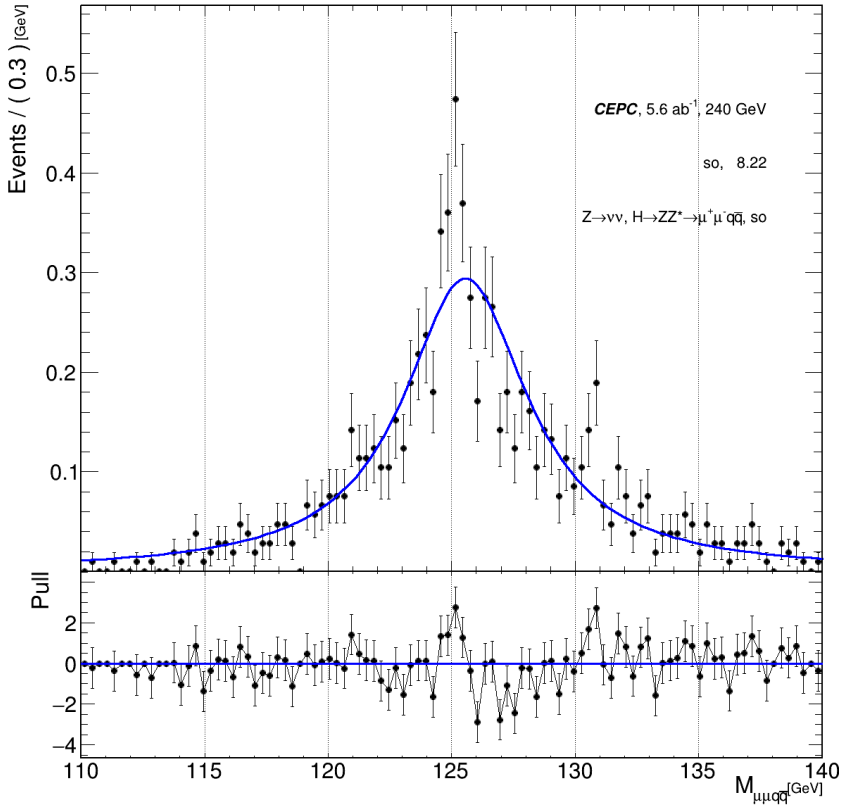
Part 3. Multiple Signal P.d.f.s

➢ Pdf construction

➢ $\nu\nu H\mu\mu jj$ channel (cut-based)



➢ vzmj signal



➢ vzmj signal other (mmHzz + qqHzz)

Part 3. Multiple Signal P.d.f.s

➢ Fitting Results

➢ Cut-based Results

Channel	Cut-based (2D cuts applied)	S	S’
μμHvvjj	**17.40**	**19.22**	**85.09**
μμHjjvv	**63.13**	**71.51**	**237.95**
vvHμμjj	**13.04**	**29.73**	**255.75**
vvHjjμμ	**28.41**	**67.42**	**324.81**
qqHvvμμ	**57.26**	**105.21**	**367.85**
qqHμμvv	**64.04**	**229.43**	**1150.72**
Combined	**9.44**	**8.39**	

Part 3. Multiple Signal P.d.f.s

➢ Fitting Results

➢ BDT Results

Channel	Cut-based (2D cuts applied)	S	S’
$\mu\mu Hvvjj$	**14.76**	**16.14**	**79.16**
$\mu\mu Hjjvv$	**56.28**	**64.28**	**190.11**
$vvH\mu\mu jj$	**12.77**	**22.92**	**402.47**
$vvHjj\mu\mu$	**24.32**	**51.67**	**262.98**
$qqHvv\mu\mu$	**43.78**	**83.90**	**425.47**
$qqH\mu\mu vv$	**41.27**	**71.28**	**1287.07**
Combined	**8.50**	**7.80**	