

Current State of $H \rightarrow ZZ^*$ analysis



Institute of High Energy Physics, CAS

Tao Yang

➤ Normalization

- MC sample : 5000 fb⁻¹

| Process | L (fb ⁻¹) | final states | X-section (fb) | events expected |
|---------|-----------------------|--------------|----------------|-----------------|
| zh | 5000 | e1e1h_zz | 0.186 | 930 |
| | | e2e2h_zz | 0.179 | 895 |
| | | e3e3h_zz | 0.178 | 890 |
| | | nnh_zz | 1.22 | 6100 |

- CEPC 240GeV : 5600 fb⁻¹

factor: 1.12

| Process | L (fb ⁻¹) | final states | X-section (fb) | events expected |
|---------|-----------------------|--------------|----------------|-----------------|
| zh | 5600 | e1e1h_zz | 0.186 | 1042 |
| | | e2e2h_zz | 0.179 | 986 |
| | | e3e3h_zz | 0.178 | 997 |
| | | nnh_zz | 1.22 | 6832 |



- MC sample (5000 fb⁻¹) before normalization

e2e2h_zz

| cut | llhzz | zh | 2f | 4f |
|--------------------------|--------|----------|------------|------------|
| Raw events | 100000 | 12557950 | 8828594187 | 1180400980 |
| Pre-selection | 67452 | 831986 | 559944 | 676820 |
| Signal or not | 22294 | 809692 | 559944 | 676820 |
| missing mass > dijet | 11392 | 114222 | 262087 | 221169 |
| M(dimuon) | 10475 | 52532 | 179250 | 45102 |
| RecM(dimuon) | 10456 | 50740 | 20465 | 14144 |
| N(pfo) | 10343 | 11499 | 797 | 714 |
| Pt(total visible) | 9806 | 10255 | 105 | 301 |
| Min angle | 9068 | 9493 | 78 | 186 |
| Missing Mass & M(dijets) | 6544 | 1649 | 74 | 74 |
| Single jet | 5663 | 1164 | 0 | 10 |

tag information from MC

➤ Normalization for LingTen's method

expected events for e2e2_h_vvjj : $5600 * 6.77 * 0.0264 * 0.2 * 0.69 = 138$

| cut | lhzz | zh | 2f | 4f | | | | |
|--------------------------|--------|------|----------|----------|------------|------------|------------|------------|
| Raw events | 100000 | 1212 | 12557950 | 12557950 | 8828594187 | 8828594187 | 1180400980 | 1180400980 |
| Pre-selection | 67452 | 817 | 831986 | 831986 | 559944 | 559944 | 676820 | 676820 |
| Signal or not | 22294 | 270 | 809692 | 809692 | 559944 | 559944 | 676820 | 676820 |
| missing mass > dijet | 11392 | 138 | 114222 | 114222 | 262087 | 262087 | 221169 | 221169 |
| M(dimuon) | 10475 | 127 | 52532 | 52532 | 179250 | 179250 | 45102 | 45102 |
| RecM(dimuon) | 10456 | 126 | 50740 | 50740 | 20465 | 20465 | 14144 | 14144 |
| N(pfo) | 10343 | 125 | 11499 | 11499 | 797 | 797 | 714 | 714 |
| Pt(total visible) | 9806 | 118 | 10255 | 10255 | 105 | 105 | 301 | 301 |
| Min angle | 9068 | 109 | 9493 | 9493 | 78 | 78 | 186 | 186 |
| Missing Mass & M(dijets) | 6544 | 79 | 1649 | 1649 | 74 | 74 | 74 | 74 |
| Single jet | 5663 | 68 | 1164 | 1164 | 0 | 0 | 10 | 10 |

scale = $138/11392$

Unnormalized background?



► Normalization update

expected events for e2e2_h_zz : **986**

| cut | lhzz | zh | 2f | 4f | | | | |
|--------------------------|--------|-----|----------|--------|------------|----------|------------|----------|
| Raw events | 100000 | 986 | 12557950 | 123821 | 8828594187 | 87049939 | 1180400980 | 11638754 |
| Pre-selection | 67452 | 665 | 831986 | 8203 | 559944 | 5521 | 676820 | 6673 |
| Signal or not | 22294 | 220 | 809692 | 7984 | 559944 | 5521 | 676820 | 6673 |
| missing mass > dijet | 11392 | 112 | 114222 | 1126 | 262087 | 2584 | 221169 | 2181 |
| M(dimuon) | 10475 | 103 | 52532 | 518 | 179250 | 1767 | 45102 | 445 |
| RecM(dimuon) | 10456 | 103 | 50740 | 500 | 20465 | 202 | 14144 | 139 |
| N(pfo) | 10343 | 102 | 11499 | 113 | 797 | 8 | 714 | 7 |
| Pt(total visible) | 9806 | 97 | 10255 | 101 | 105 | 1 | 301 | 3 |
| Min angle | 9068 | 89 | 9493 | 94 | 78 | 1 | 186 | 2 |
| Missing Mass & M(dijets) | 6544 | 64 | 1649 | 16 | 74 | 1 | 74 | 1 |
| Single jet | 5663 | 56 | 1164 | 11 | 0 | 0 | 10 | 0 |

scale = **986**/100000

