CEPC Higgs, Higher Energy Extrapolation

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Existing results, 240GeV, 5.6iab

($5.6ab^{-1}$)	CEPC 240
$\sigma(ZH)$	**0.50%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{bb})$	**0.27%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{cc})$	**3.3%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{gg})$	**1.3%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{WW})$	**1.0%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mathrm{ZZ})$	**5.1%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \tau\tau)$	**0.8%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \gamma\gamma)$	**6.8%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to \mu\mu)$	**12%**
$\sigma(\mathrm{vv}H) * \mathrm{Br}(\mathrm{H} \to \mathrm{bb})$	**3.0%**
$\mathrm{Br}_{\mathrm{upper}}(\mathrm{H} \to \mathrm{inv.})$	**0.26%**
$\sigma(ZH) * \mathrm{Br}(\mathrm{H} \to Z\gamma)$	**16%**
Width	**2.8%**

- Temporary target: like Fcc-ee (CERN-ACC-2018-0057) did:
  - 0.2 iab 350GeV + 1.5 iab 365GeV
- For benchmark scale
  - Take 1 iab 365GeV;
  - 240GeV:
    - ffH: 203fb; ZH: 196.9; vvH: 6.77;

Cross Sections

- target: like Fcc-ee (CERN-ACC-2018-0057) did:
  - 0.2 iab 350GeV + 1.5 iab 365GeV
- Temporary benchmark: 1 iab 365GeV

Would update with Hao and Gang's latest result;

  - 240GeV:
    - ffH: 200.4fb; ZH: 196.9; vvH: 6.2; interference: ~10% of vvH; about 313:10; (Z->vv : vvH = 6.2:1)
    - in the following we ignore the interference, unless it proves really matter.
  - 350GeV:
    - ZH: 133.3fb; vvH: 26.7fb; about 5:1; (Z->vv : vvH = 1:1)
  - 365GeV:
    - ZH: 120fb; vvH: 30fb; about 4:1; (Z->vv : vvH = 4:5)

bkg cross sections

Would update with Hao and Gang's latest result;

pb	240	350	365
ee	24.7		
mm	5.3		
qq	54.1	21	
WW	16.7	10.4	9.81
ZZ	1.1		
sZ	4.54		
sW	5.09		

Extrapolation strategy

- yields: scale by cross section;
- shape:
  - inv/rec mass:
    - if it is corresponding to Z/H system, would stay the same;
    - bkg process, phase space distribution, would spread to wider range;
      - scale 365/240
    - vvH
      - M/(240-125)*(365-125); different peak;
  - dimuon: worse resolution; from ~0.3GeV to 1GeV;
  - diphoton: better resolution; from ~2.5GeV to 2GeV;

Step by step