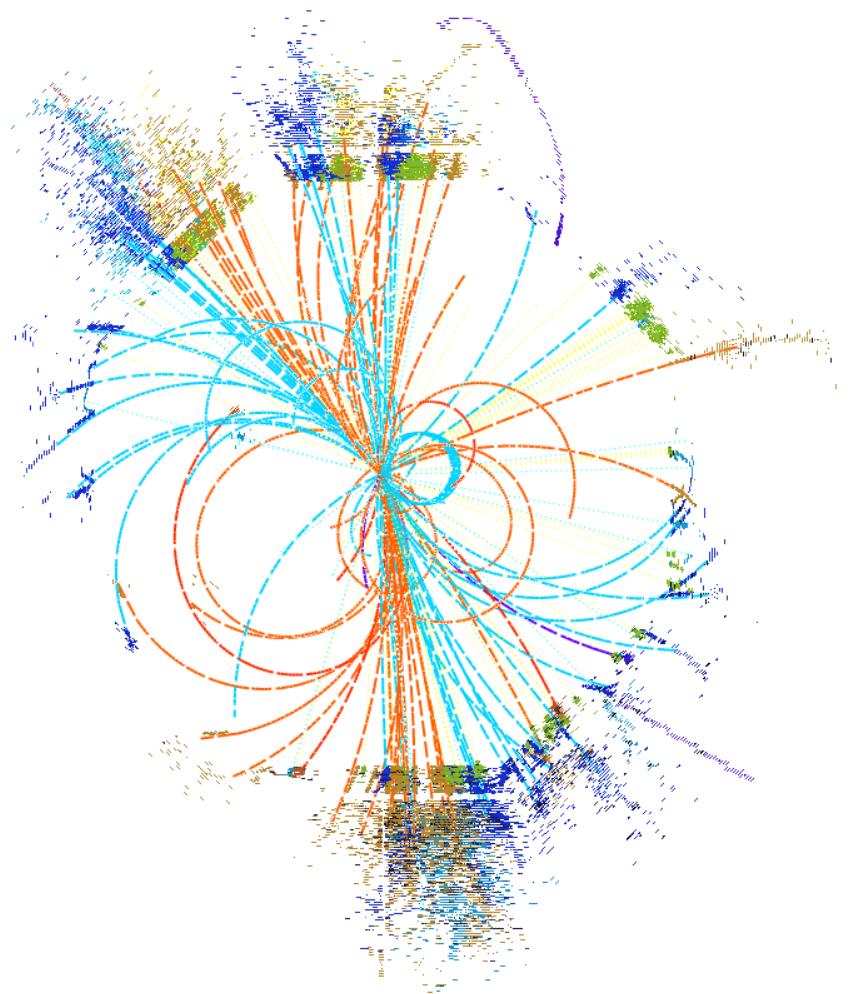




Plans for a Higgs paper



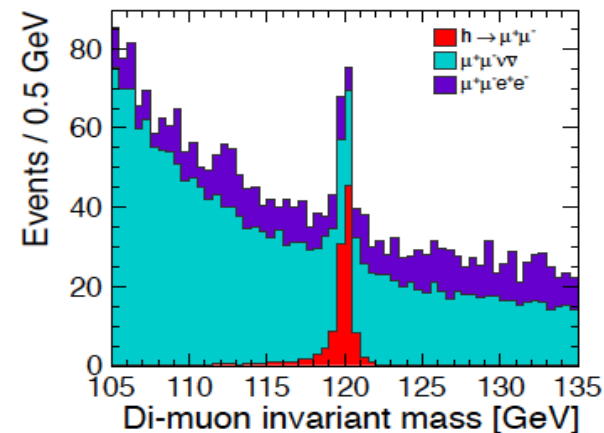
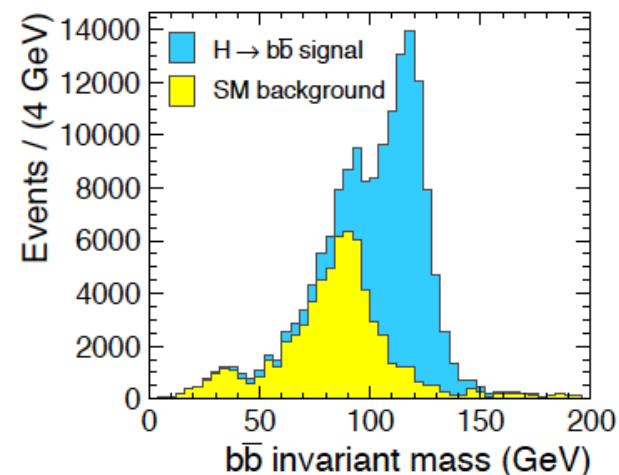
Philipp Roloff (CERN)



CLIC Workshop 2013, CERN, 29/01/2013

Higgs studies for $m_H = 120$ GeV

\sqrt{s} (GeV)	Process	Decay mode	Measured quantity	Unit	Generator value	Stat. error	Comment
350		$ZH \rightarrow \mu^+ \mu^- X$	σ	fb	4.9	4.9%	Model
			Mass	GeV	120	0.131	independent, using Z-recoil
500	SM Higgs production	$ZH \rightarrow q\bar{q}q\bar{q}$	$\sigma \times \text{BR}$	fb	34.4	1.6%	$ZH \rightarrow q\bar{q}q\bar{q}$
			Mass	GeV	120	0.100	mass reconstruction
500		$ZH, H\nu\bar{\nu} \rightarrow \nu\bar{\nu}q\bar{q}$	$\sigma \times \text{BR}$	fb	80.7	1.0%	Inclusive sample
			Mass	GeV	120	0.100	
1400		$H \rightarrow \tau^+ \tau^-$			19.8	<3.7%	
3000	WW fusion	$H \rightarrow b\bar{b}$	$\sigma \times \text{BR}$	fb	285	0.22%	
		$H \rightarrow c\bar{c}$			13	3.2%	
		$H \rightarrow \mu^+ \mu^-$			0.12	15.7%	
1400	WW		Higgs tri-linear			~20%	
3000	fusion		coupling g_{HHH}			~20%	



CDR Vol. 2: Focus on 3 TeV \rightarrow large statistics, rare processes accessible
CDR Vol. 3: Started looking at lower energies

- Comprehensive overview of possible Higgs studies at 350, 1400 and 3000 GeV
- Aim to present (first) results at ECFA LC2013 workshop at DESY
- Staging scenario similar to machine studies:

350 GeV: 500 fb^{-1}

1.4 TeV: 1.5 ab^{-1}

3 TeV: 2 ab^{-1}

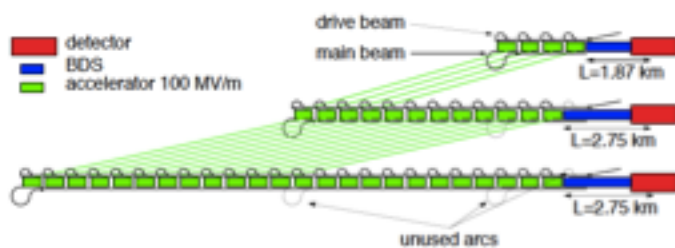
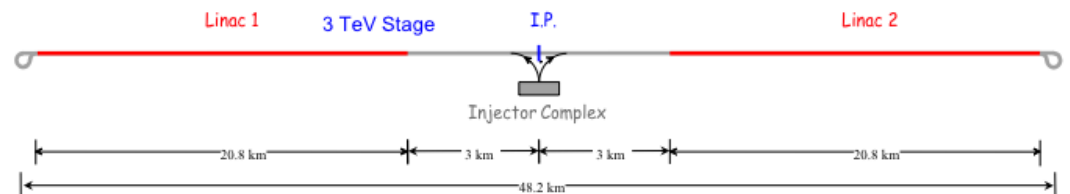
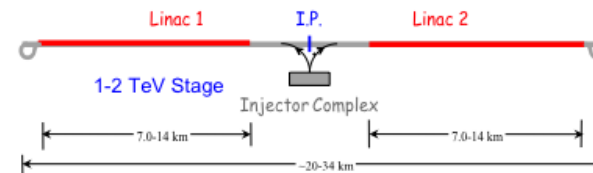
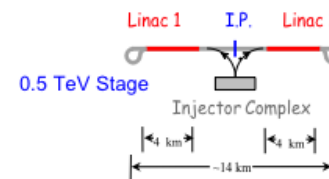


Fig. 3.6: Simplified upgrade scheme for CLIC staging scenario B.

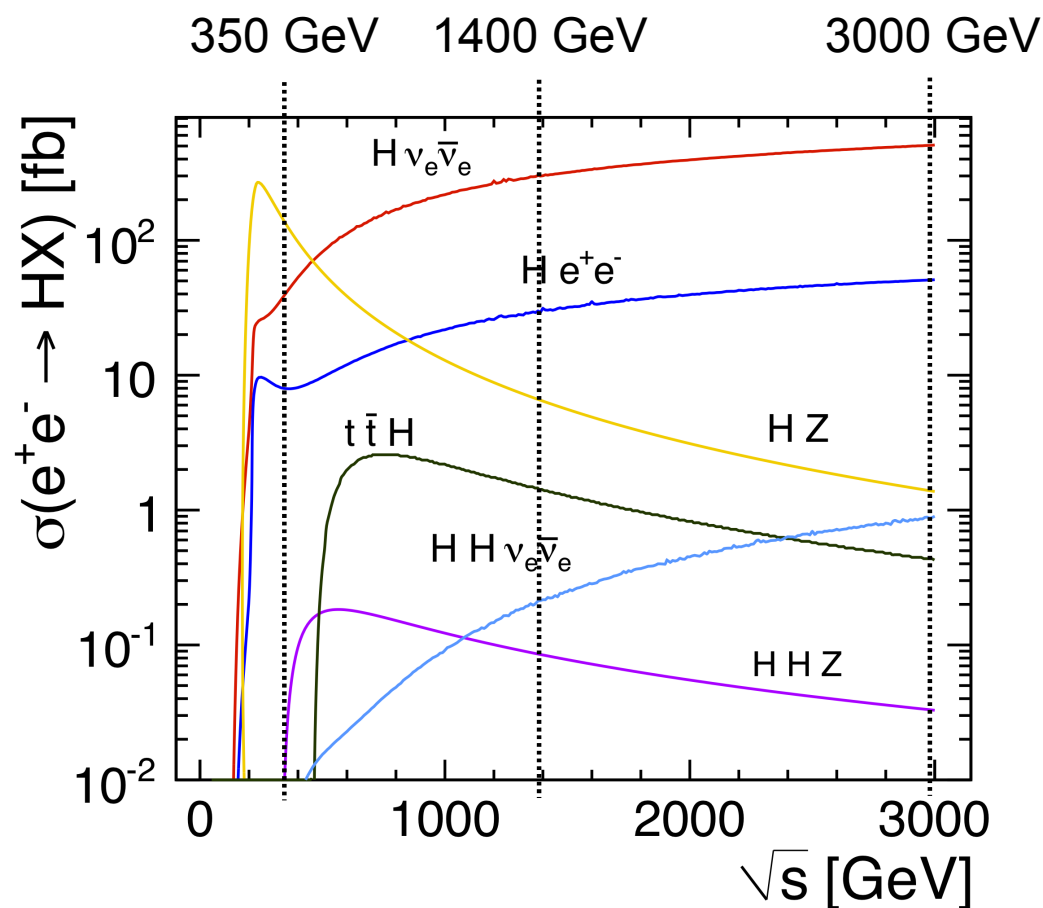


At 350 GeV: Mostly HZ, allows to reconstruct Higgs from recoil mass

At higher energies:

- WW fusion dominates, high number of Higgs bosons
- ZZ fusion about an order of magnitude smaller
- The extraction of the Higgs self-coupling from $HH\nu\bar{\nu}$ becomes possible

1.4 TeV: Suitable to measure the top Yukawa coupling using $t\bar{t}H$ events



- Measurement of $H \rightarrow \tau\tau$ at 350 GeV and 1.4 TeV
- Measurement of the top Yukawa coupling at 1.4 TeV
- Measurement of the Higgs self-coupling at 1.4 and 3 TeV
- Simultaneous extraction of $H \rightarrow b\bar{b}$, $H \rightarrow c\bar{c}$ and $H \rightarrow gg$ at 350 GeV and 1.4 TeV
- Measurement of $H \rightarrow WW^*$ at 350 GeV and 1.4 TeV (and 3 TeV?) (qqlv and fully hadronic final states)
- ZZ fusion at 1.4 TeV (and 3 TeV?)
→ precise ratio of the HZZ to HWW couplings
- $H \rightarrow \gamma\gamma$ at 1.4 TeV
- $H \rightarrow Z\gamma$ at 1.4 TeV
- $H \rightarrow \mu\mu$ at 1.4 TeV
- Longitudinal WW scattering at 1.4 TeV (and 3 TeV?)

Further content of the paper:

- Calculate the Higgs boson width
- Combined fit of all measurements to extract the couplings?

08:00

Plans for a CLIC Higgs paper *Dr. Philipp ROLOFF*
13-2-005, CERN 08:30 - 08:40

Status of Higgs self-coupling analysis *Jan Fridolf STRUBE*
13-2-005, CERN 08:40 - 09:05

09:00

Status of Higgs to tau tau analysis *Astrid MUNNICH*
13-2-005, CERN 09:05 - 09:30

Status of Higgs to Z gamma analysis *Eva SICKING*
13-2-005, CERN 09:30 - 09:48

10:00

Status of Higgs to gamma gamma analysis *Mr. Christian GREFE*
13-2-005, CERN 09:48 - 10:06

Coffee break

Status of Higgs to bb, cc and gg analysis *Jan Fridolf STRUBE*
13-2-005, CERN 10:30 - 10:48

11:00

Status of Higgs to mu mu analysis *Dr. Ivanka BOZOVIC-JELISAVCIC et al.*
13-2-005, CERN 10:48 - 11:06

Status of Higgs to WW analysis *Nigel WATSON*
13-2-005, CERN 11:06 - 11:24

Measurement of the luminosity spectrum at CLIC *Andre SAILER*
13-2-005, CERN 11:24 - 11:49

12:00

Beam polarisation from WW production *Aura ROSCA*
13-2-005, CERN 11:49 - 12:14

Next analysis meeting: 12/02/2013 at 14:00