Analysis of the process $e^+e^- \rightarrow H_iH_j \rightarrow b\bar{b}b\bar{b}$ at TESLA

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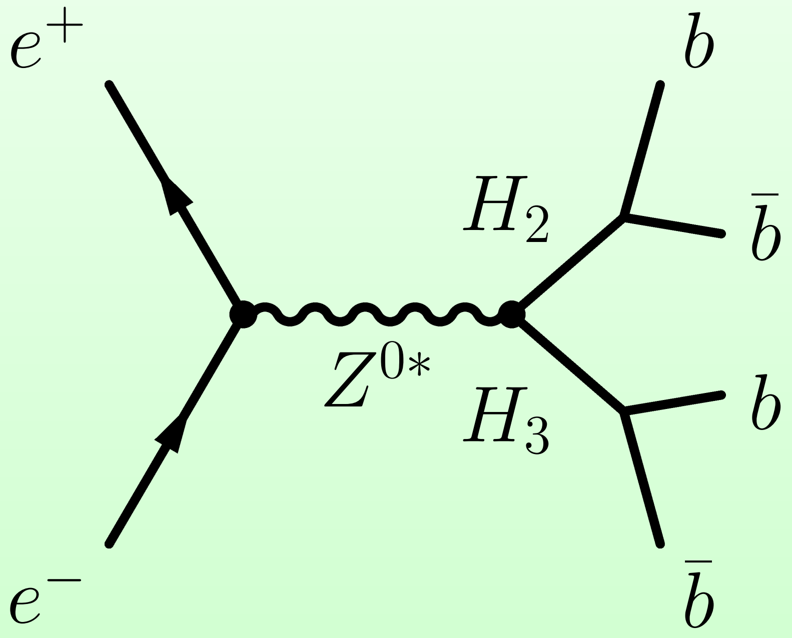
TESLA

$$\boxed{e^+e^- \rightarrow H_iH_j \rightarrow b\bar{b}b\bar{b}}$$



Using:

- HZHA: generation
- SIMDET 4.01: simulation
- ZV-TOP: b-tagging

  (SLD b-tagger)
- Kinematical Fit from DELPHI

What's new since Prague meeting:

- $t\bar{t}$ background is added
- Cuts against $t\bar{t}$ background are applied
- Rescaling of the jet energy
- Resolution plots
- Kinematical fit

Planned things till Amsterdam meeting:

- Use of the resolution functions in the kinematical fit
- Scan over the Higgs mass grid: theoretically motivated scan within CP-Violating MSSM

Analysis of $e^+e^- \to H_iH_j \to b\bar{b}b\bar{b}$ at TESLA.

Signal (example point):

Parameter	Value
$\tan\beta$	19
M_{H^+}	164 GeV
$Re(A_t)$	285 GeV
$Im(A_t)$	771 GeV

M_{H_1}	112 GeV
M_{H_2}	141 GeV
M_{H_3}	155 GeV
$N_{ev}(H_1H_2 \to b\bar{b}b\bar{b})$	200
$N_{ev}(H_2H_3 \to b\bar{b}b\bar{b})$	7000
$N_{ev}(H_1H_3 \to b\bar{b}b\bar{b})$	1720

Signal and BG samples:

Process	SX (fb)	N_{events}
$H_1H_2 \to b\bar{b}b\bar{b}$	0.4196	10000
$H_2H_3 \to b\bar{b}b\bar{b}$	12.61	10000
$H_1H_3 \to b\bar{b}b\bar{b}$	3.428	10000
$Z^0\gamma^* \to 2f$	13580	1000000
$W^+W^- \to 4q$	4134	500000
$Z^0Z^0 \to 4q$	314.3	300000
$H_1Z^0 \to b\bar{b}q\bar{q}$	34.63	10000
$H_2Z^0 \to b\bar{b}q\bar{q}$	6.043	10000
$t\bar{t} \to W^+W^-b\bar{b}$	669.3	100000

Cuts

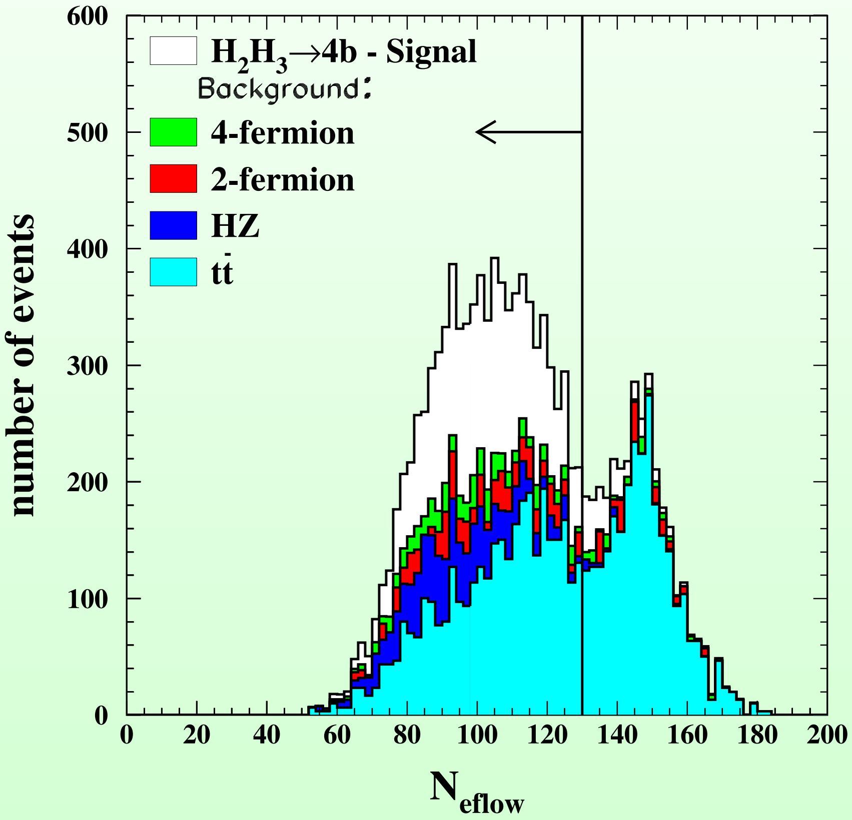
N	Variable	Cut value
1	N_{jets}	4
2	P_{vis}	$\geq$340 GeV
3	$min(N_{tracks}/jet)$	$\geq$3
4	$\lvert\cos(thrust)\rvert$	$\leq$0.8
5	$thrust$	$\leq$0.90
6	$\log(y_{34})$	$\geq$-2.9
7	N_{eflow}	$\leq$130
8	$\log(y_{56})$	$\leq$-3.0
9	B_{12}	$\geq$0.75
10	B_{34}	$\geq$0.03

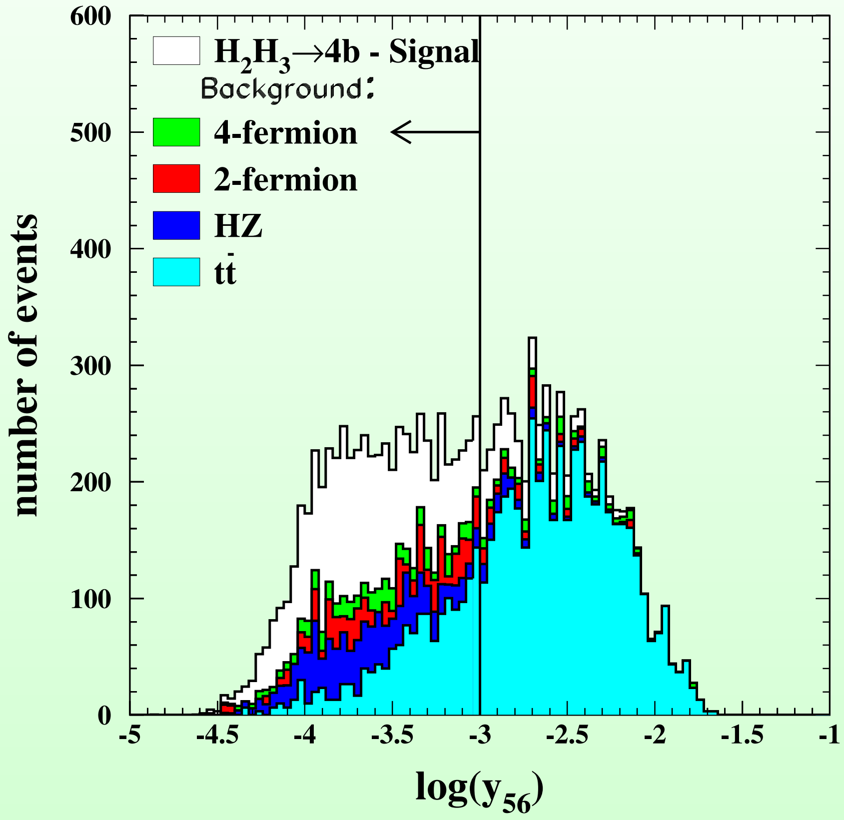
$$B_1 > B_2 > B_3 > B_4$$

$$B_{12} = \frac{B_1 B_2}{B_1 B_2 + (1-B_1)(1-B_2)}$$

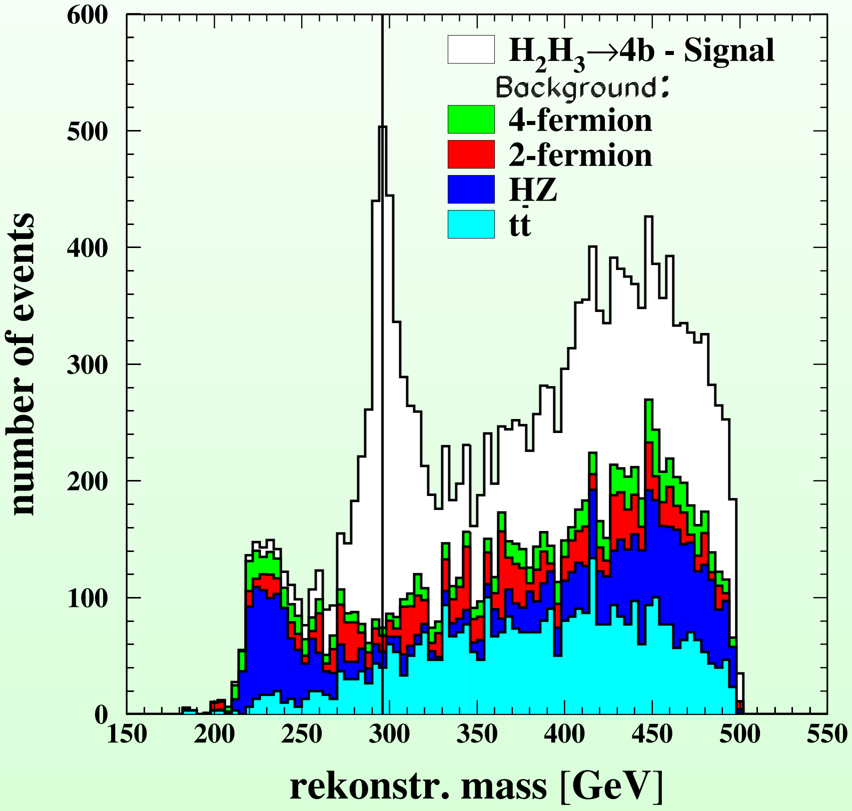
$$B_{34} = \frac{B_3 B_4}{B_3 B_4 + (1-B_3)(1-B_4)}$$

Cuts against $t\bar{t}$ background





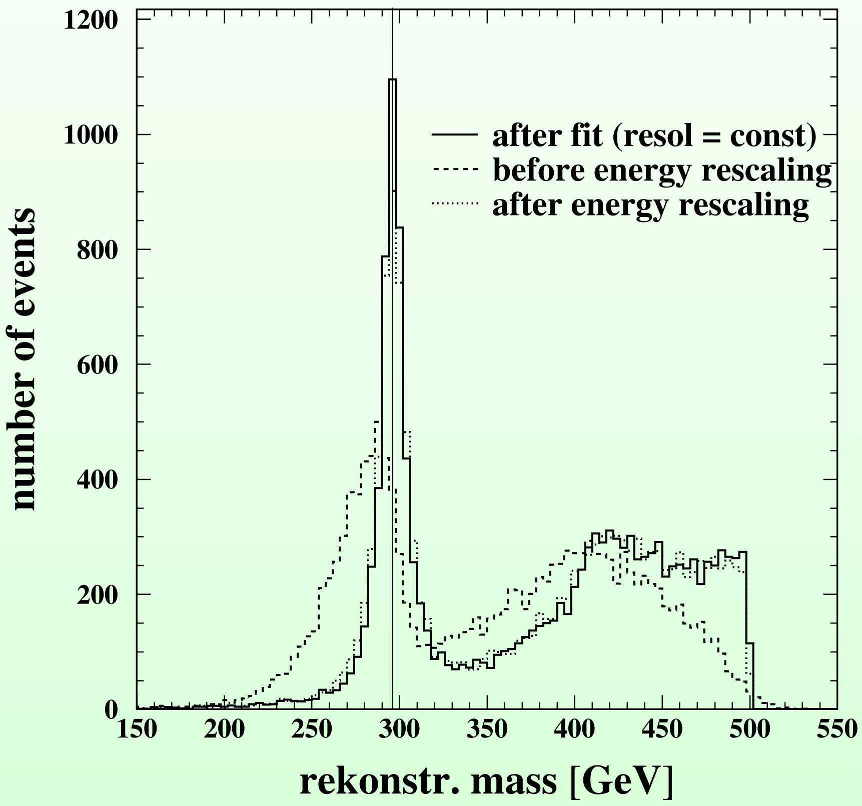
Reconstructed Mass



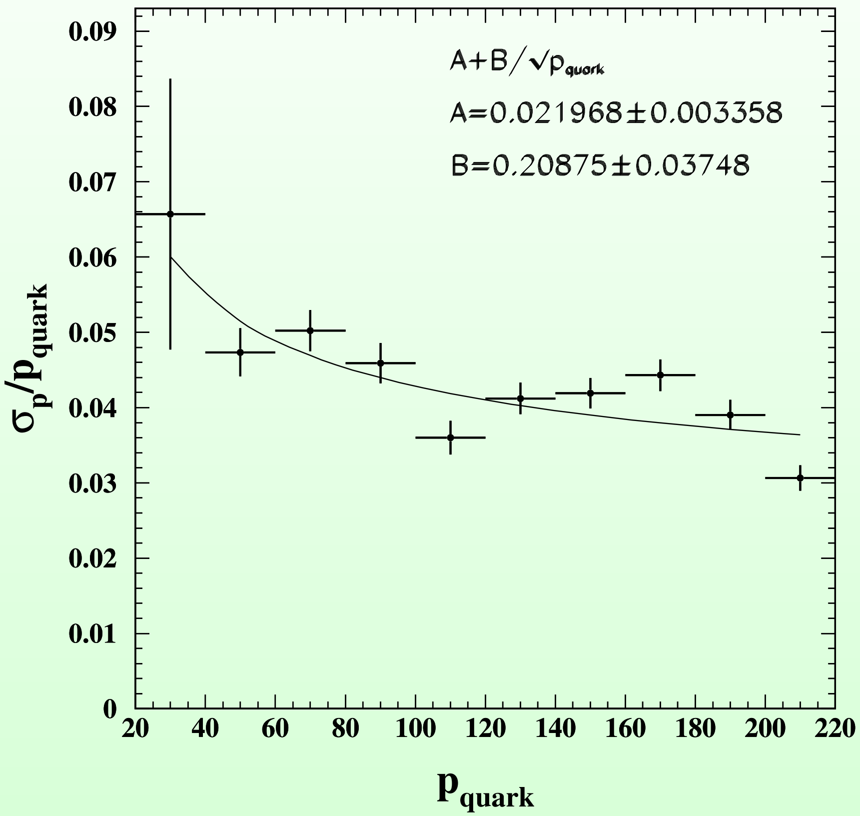
Cutflow

Cut	Cut value	Signal	Eff.	Total BG
no cuts		6304.9	100.0	9428006.7
N_{jets}	4	6304.9	100.0	9355105.7
P_{vis}	$\geq$340GeV	6217.3	98.6	6020136.5
N_{tr}/jet	$\geq$3	5706.0	90.5	2669601.8
$\cos(thrust)$	$\leq$0.8	5252.8	83.3	1383264.3
$thrust$	$\leq$0.90	5125.5	81.3	399239.1
$\log(y_{34})$	$\geq$-2.9	4979.2	79.0	356903.1
N_{eflow}	$\leq$130	4554.4	72.2	314351.1
$\log(y_{56})$	$\leq$-3.0	3929.6	62.3	207202.1
B_{12}	$\geq$0.75	3719.0	59.0	48610.7
B_{34}	$\geq$0.03	2844.9	45.1	3158.7

Reconstructed Mass



Resoluton function



Resolution function