

DBD SiD/ILD Higgs Branching Ratio Analyses

Presented by
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The Joint SiD/ILD Mtg. (24 Jan. 2013)

Status from last meeting

ILD

Cuts	$h \rightarrow b\bar{b}$	$h \rightarrow c\bar{c}$	$h \rightarrow g\bar{g}$	$h \rightarrow \text{other}$	2f	4f	6f
Generated	128,701	6,058	19,044	69,605	3,890,180	13,514,000	346,419
E_{vis}	117,196	5,504	17,223	62,132	1,509,560	6,496,150	127,582
P_T	111,662	5,266	16,541	57,591	397,594	3,728,650	118,476
P_Z	111,350	5,247	16,490	57,494	360,477	3,516,270	117,336
N_{PFO}	110,995	5,212	16,473	40,567	198,131	2,337,060	104,438
$ \cos\theta_h $	103,857	4,872	15,533	38,800	49,689	1,847,580	92,833
M_h	63,883	3,467	9,132	6,895	2,901	93,094	12,839
Efficiency	49.6%	57.2%	48.0%	9.9%	0.1%	0.7%	3.7%

SiD for 1/ab

(Cut Name)	all	others	SM	evW	bb	cc	gg	WW	ss
cut #0 (all)	6.97e+09	3.86e+04	6.87e+09	9.47e+07	2.40e+05	1.10e+04	3.46e+04	8.89e+04	1.66e+02
cut #1 (ptvis>50. && ptvis<250.	5.05e+07	2.06e+04	3.32e+07	1.69e+07	1.72e+05	8.13e+03	2.56e+04	6.05e+04	1.24e+02
cut #2 (evis>100. && evis<400.	2.47e+07	1.76e+04	1.07e+07	1.38e+07	1.62e+05	7.73e+03	2.45e+04	5.35e+04	1.18e+02
cut #3 (MvisJETS>110. && MvisJETS<140.	1.28e+06	4.31e+03	8.37e+05	3.09e+05	9.81e+04	5.48e+03	1.51e+04	1.37e+04	8.48e+01
cut #4 (fabs(cjet1)<0.90 && fabs(cjet2)<0.90	4.86e+05	3.24e+03	2.17e+05	1.67e+05	7.25e+04	4.08e+03	1.14e+04	1.10e+04	5.69e+01
cut #5 (bprob1>0.8 && bprob2>0.8	4.20e+04	2.13e+02	1.16e+03	3.33e+03	3.71e+04	1.20e+01	1.26e+02	1.42e+01	0.00e+00
cut #6 (nTrks>15	4.06e+04	2.10e+02	1.13e+03	3.14e+03	3.60e+04	1.20e+01	1.26e+02	1.42e+01	0.00e+00

SiD for 500/fb

cuts__ (Cut Name)	others	evW	SM	bb	cc	gg	WW	ss
cut #0 (all)	19279	47345721	3435299073	119811	5509	17294	44449	83
cut #1 (ptvis>50. && ptvis<250.	10304	8468763	16613826	85908	4064	12812	30270	62
cut #2 (evis>100. && evis<400.	8812	6875423	5332956	81224	3865	12258	26767	59
cut #3 (MvisJETS>110. && MvisJETS<140.	2157	154264	418441	49033	2742	7545	6873	42
cut #4 (fabs(cjet1)<0.90 && fabs(cjet2)<0.90	1621	83264	108647	36239	2038	5709	5499	28
cut #5 (bprob1>0.8 && bprob2>0.8	106	1666	580	18547	6	63	7	0
cut #6 (nTrks>15	105	1568	567	17990	6	63	7	0

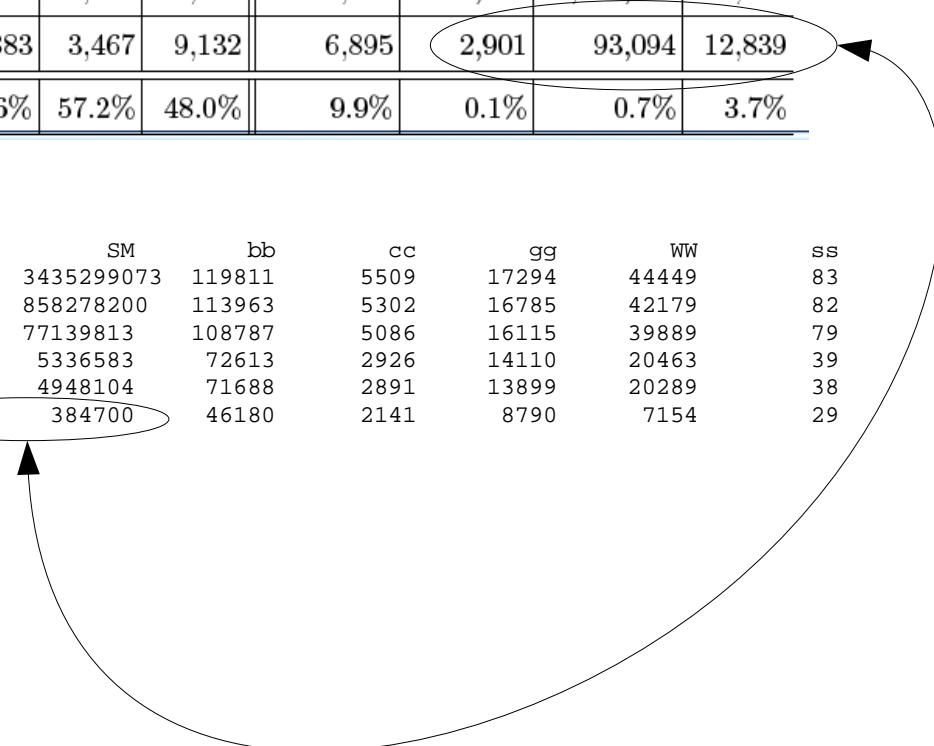
Emulation of the ILD analysis

True ILD

Cuts	$h \rightarrow b\bar{b}$	$h \rightarrow c\bar{c}$	$h \rightarrow gg$	$h \rightarrow \text{other}$	2f	4f	6f
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M_h	63,883	3,467	9,132	6,895	2,901	93,094	12,839
Efficiency	49.6%	57.2%	48.0%	9.9%	0.1%	0.7%	3.7%

SiD's emulation

cuts_ (Cut Name)	others	evW	SM	bb	cc	gg	WW	SS
cut #0 (all)	19279	47345721	3435299073	119811	5509	17294	44449	83
cut #1 ($e_{\text{vis}} > 40.$ && $e_{\text{vis}} < 450.$)	17546	28565229	858278200	113963	5302	16785	42179	82
cut #2 ($p_{T\text{vis}} > 20.$)	15826	16875001	77139813	108787	5086	16115	39889	79
cut #3 ($n_{\text{Trks}} > 20$)	3013	4836928	5336583	72613	2926	14110	20463	39
cut #4 ($f_{\text{abs}}(c_{\text{jet1}}) < 0.98$ && $f_{\text{abs}}(c_{\text{jet2}}) < 0.98$)	2977	4703876	4948104	71688	2891	13899	20289	38
cut #5 ($M_{\text{visJETS}} > 110.$ && $M_{\text{visJETS}} < 150.$)	1167	144433	384700	46180	2141	8790	7154	29



Backgrounds

eexyev.eL.pR	15563.7
eeveyx.eL.pL	20690
vvxylv.eL.pR	21196.2
eexylv.eL.pR	23930.1
xxveyx.eL.pR	25645.1
vvvlyx.eL.pR	27198.3
eexyyx.eL.pL	38608.5
eexyyx.eL.pR	47731.4
4f_sznu_sl.eL.pR	51894.8
4f_sw_sl.eL.pR	128166

"a" is the symbol for a photon
 "x" is the alias for an an up-type quark. i.e. and up quark or charm quark
 "y" is the alias for a down-type quark, i.e. a down, stange or bottom quark

Process	Polarization	#events
higgs	-80/+20	1,544,398
<i>evW + eeZ + vvZ semileptonic</i>	-80/+20	6,570,292
all other SM background mix	-80/+20	3,232,672

Process	\mathcal{L} ab ⁻¹ per pol.	# Events (10 ⁵) P(e ⁻ /e ⁺) -0.8/+0.2
$e\gamma \rightarrow e\gamma$	$4 \cdot 10^{-5}$	0.5
$e^+e^- \rightarrow 2f, 4f$	0.034	3.7
$e\gamma \rightarrow 3f$	0.003	3.5
$e\gamma \rightarrow 5f$	0.25	3.1
$e^+e^- \rightarrow 6f$	1.0	1.8
$\Upsilon \rightarrow 2f$	0.001	5.7
$\Upsilon \rightarrow 4f$	0.083	2.5
$\Upsilon \rightarrow$ minijets:		
$4 < p_T < 40$ GeV	0.012	9.2
$p_T > 40$ GeV	0.105	2.3

Table from Tim Barklow

Results from SiD Analysis for 500/fb

-80/+20

Table 1.8: Relative uncertainties on the Higgs $\sigma \times BR$ expected for an integrated luminosity of 1 ab^{-1} at $\sqrt{s} = 1 \text{ TeV}$ using the SiD detector.

$h \rightarrow$	#events	$\Delta(\sigma \times BR)$	For 500/fb
$b\bar{b}$	36013	0.00556 ± 0.00005	0.0082
$c\bar{c}$	1392	0.069 ± 0.002	0.10
gg	4708	0.0319 ± 0.0007	0.044
W^+W^-	6178	0.0362 ± 0.0006	0.063

+80/-20

PNNL data access issue