

Weekly report

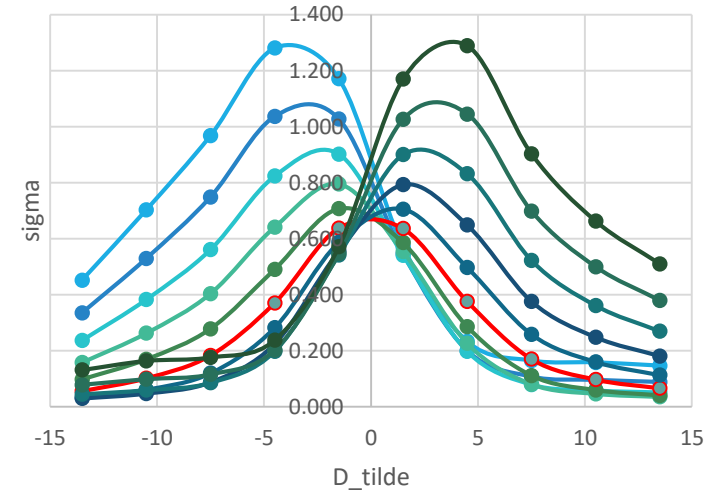
FANGYI GUO

Working status

VBF Higgs CP: optimizing the binning.

- Define the sensitivity:
 - Divide all events into 10 OO bins: [-15, -12, -9, -6, -3, 0, 3, 6, 9, 12, 15]
 - Get N_{vbf} , N_{ggh} , N_{bkg} in each bin.
 - For each d , calculate $\sigma_{VBF(d)}^{ibin} = N_{vbf} / \sqrt{N_{bkg} + N_{ggh}}$

$d \backslash \langle OO \rangle$	-0.2	-0.16	-0.12	-0.08	-0.04	0	0.04	0.08	0.12	0.16	0.2
-13.5	0.452	0.335	0.237	0.158	0.098	0.056	0.034	0.030	0.045	0.079	0.131
-10.5	0.703	0.530	0.383	0.263	0.169	0.102	0.062	0.047	0.060	0.099	0.164
-7.5	0.968	0.749	0.561	0.404	0.278	0.184	0.120	0.088	0.086	0.116	0.176
-4.5	1.281	1.036	0.824	0.642	0.491	0.371	0.282	0.225	0.198	0.202	0.238
-1.5	1.171	1.027	0.902	0.795	0.707	0.638	0.587	0.555	0.542	0.547	0.571
1.5	0.571	0.547	0.541	0.554	0.586	0.636	0.706	0.793	0.900	1.025	1.170
4.5	0.233	0.200	0.198	0.226	0.286	0.376	0.497	0.649	0.831	1.045	1.289
7.5	0.165	0.108	0.080	0.081	0.111	0.170	0.259	0.376	0.523	0.698	0.903
10.5	0.158	0.096	0.059	0.047	0.059	0.097	0.160	0.248	0.362	0.500	0.663
13.5	0.147	0.089	0.052	0.036	0.041	0.066	0.113	0.181	0.270	0.380	0.510

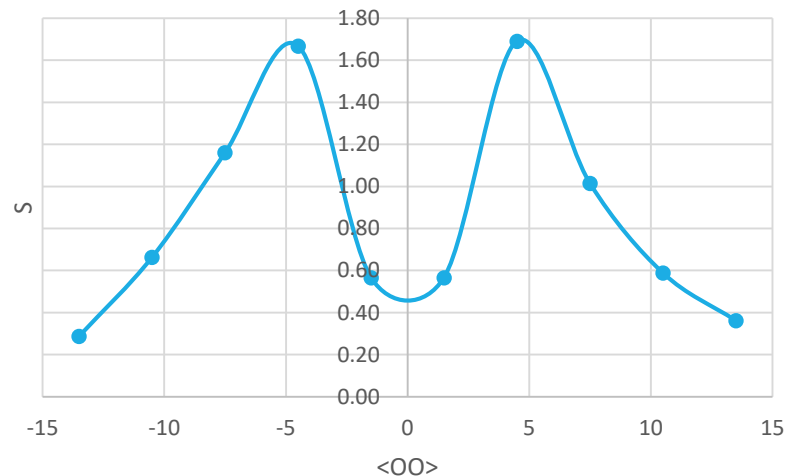


σ vs. $\langle OO \rangle$ curve. Red line is SM.
Others are different d_{tilde} samples

Working status

VBF Higgs CP

- Define the sensitivity: $|\Delta\sigma| = |\sigma_d^{ibin} - \sigma_{SM}^{ibin}|$ is a function of $\langle OO \rangle$ and d .
- $S = \sum_d \sqrt{\Delta\sigma_d^2}$ is a function of $\langle OO \rangle$. The higher S means higher sensitivity.

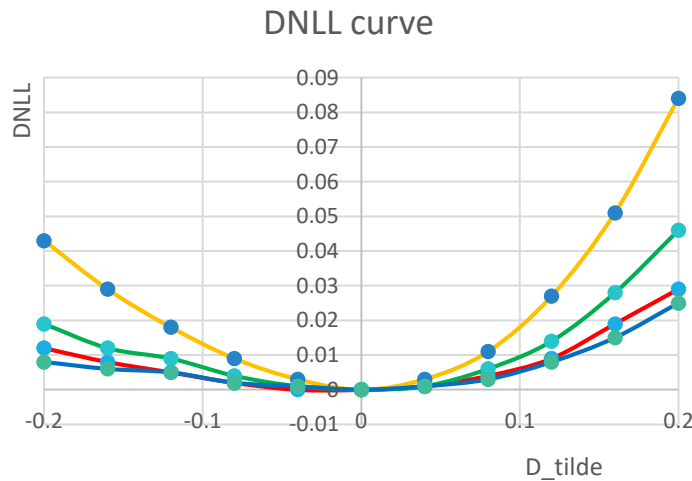


$|\langle OO \rangle| \in [3, 6]$ range has higher sensitivity than central region. This might be the main reason of the improvement from removing central region in fitting.

Working status

Cross check:

- Perform 1D fit in each OO bins. (Very preliminary check).
- Background statistics is very low, so a set of pseudo data (1M) was used.

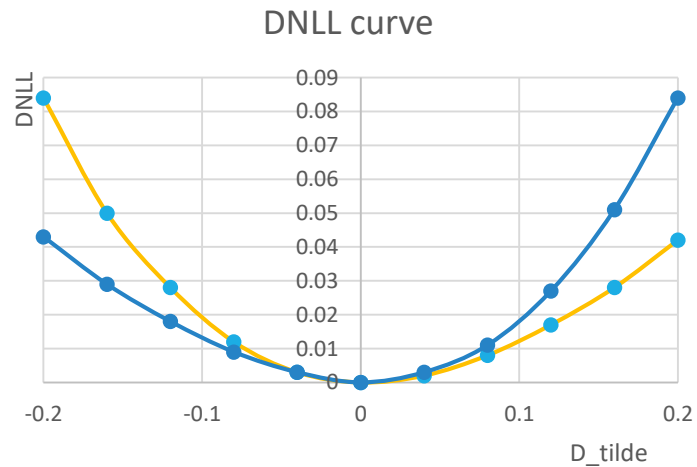


Red: $OO \in [0, 3]$

Yellow: $OO \in [3, 6]$

Green: $OO \in [6, 9]$

Blue: $OO \in [9, 12]$



Yellow: $OO \in [-6, -3]$

Blue: $OO \in [3, 6]$

Working status

Summary

- Tail range has higher sensitivity.
- In previous 1D fit, we only separate events in $[-3, 3]$ into several bins, in order to have enough statistics.
- Q: in 2D, how to “separate” and then “combine” several ranges?

QT:

- Technical supervisor and convener did reply me.
- I need to study the photon topo cluster variables in $Z \rightarrow \ell\ell g$ process to do photon ID, but it seems $Z \rightarrow \ell\ell g$ DAOD(EGAM3, EGAM4) doesn't have these variables?

