CEPC HZZ Project

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Project Overview

	mm(vvjj)	mm(jjvv)	vvHZZ	qq(vvmm)	qq(mmvv)
Cut-based	Done	Done	Done	Done	Done
Merge into framework	Done	Done	Done	Done	Done
BDT Study	Done	Done	Done	Done	Done
Put BDT code in package	Done	On-going	On-going	On-going	On-going
Higgs width fitting in the framework	Checking	Checking	Done	Done	Done
Combined fitting	On-going				

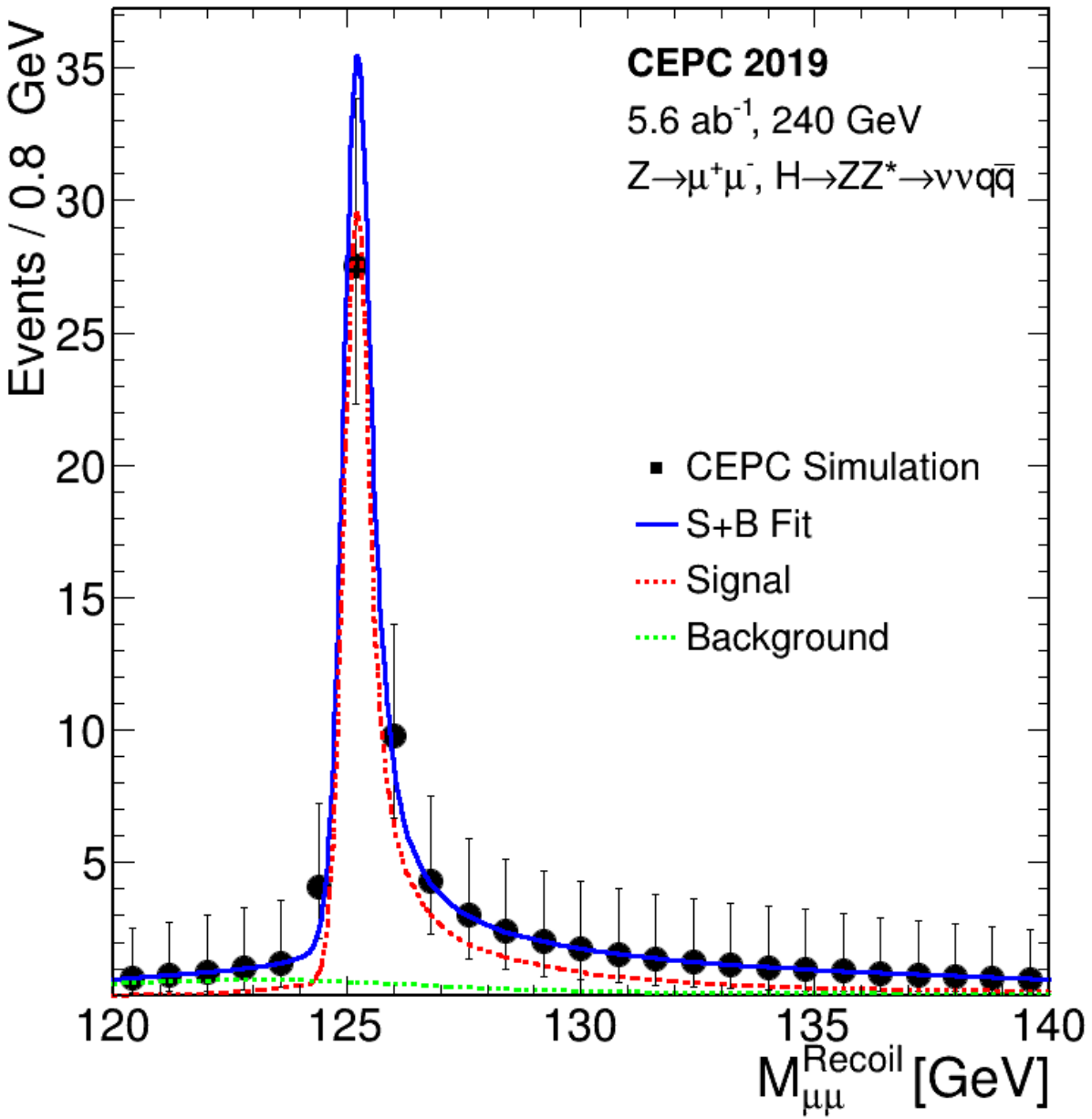
	Status
Table & Plot style	Done
CEPC Memo	On-going
EFT	On-going (Ryuta)

Fitting Progress

Channel	Kaili's last results (%)	Current results
$\mu\mu Hvvjj$	17.8329	17.8219
$\mu\mu Hjjvv$	15.4416	15.4143
$vvHZZ$	71.489	71.0898
$qqHvv\mu\mu$	54.2534	53.9685
$qqH\mu\mu vv$	66.4939	65.773

Fitting Progress

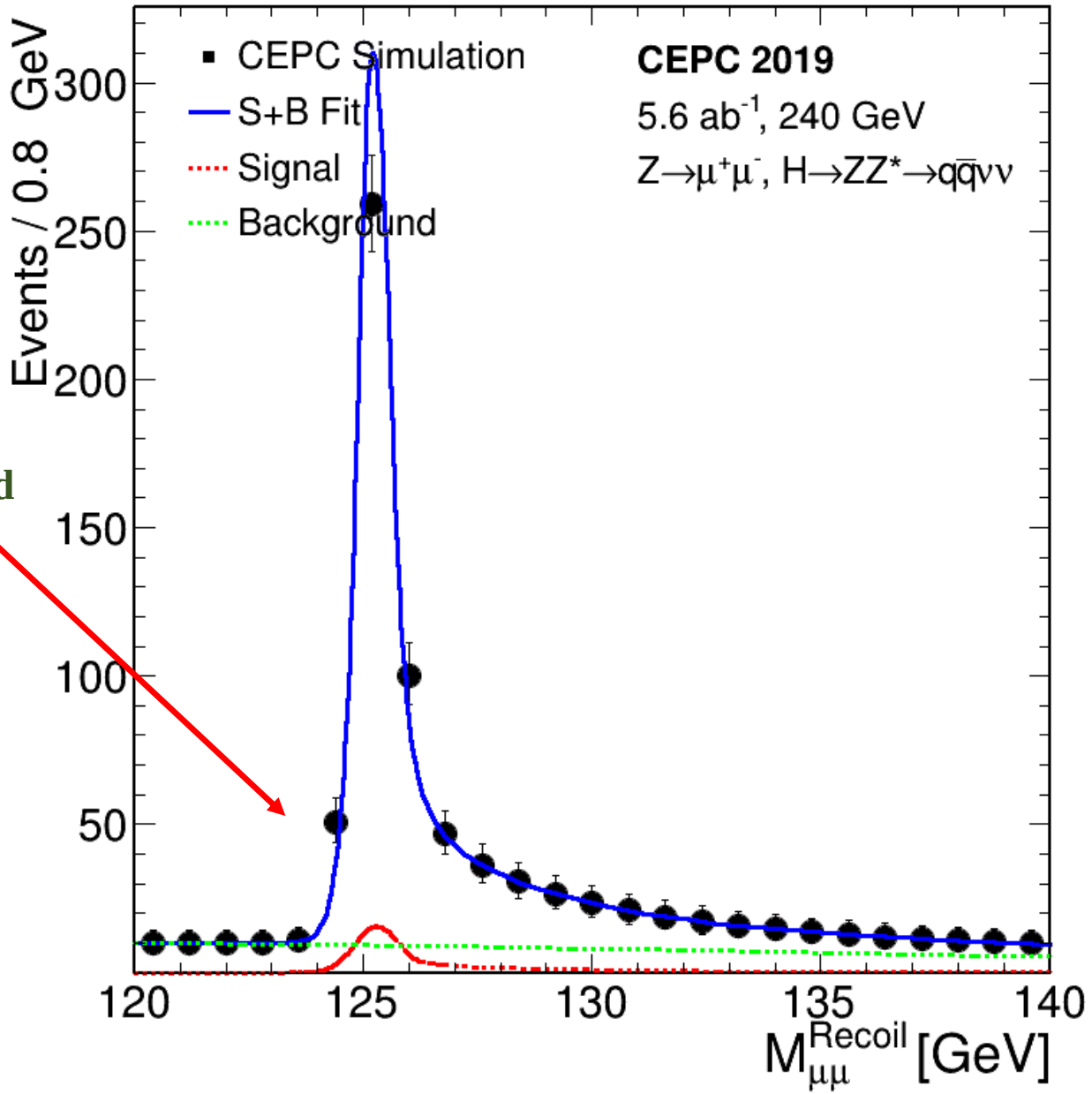
- ***μμHνvjj***



Fitting Progress

- ***μμHjjνν***

Signal + Background ≠ S+B Fit ? (Asked by Ryuta)



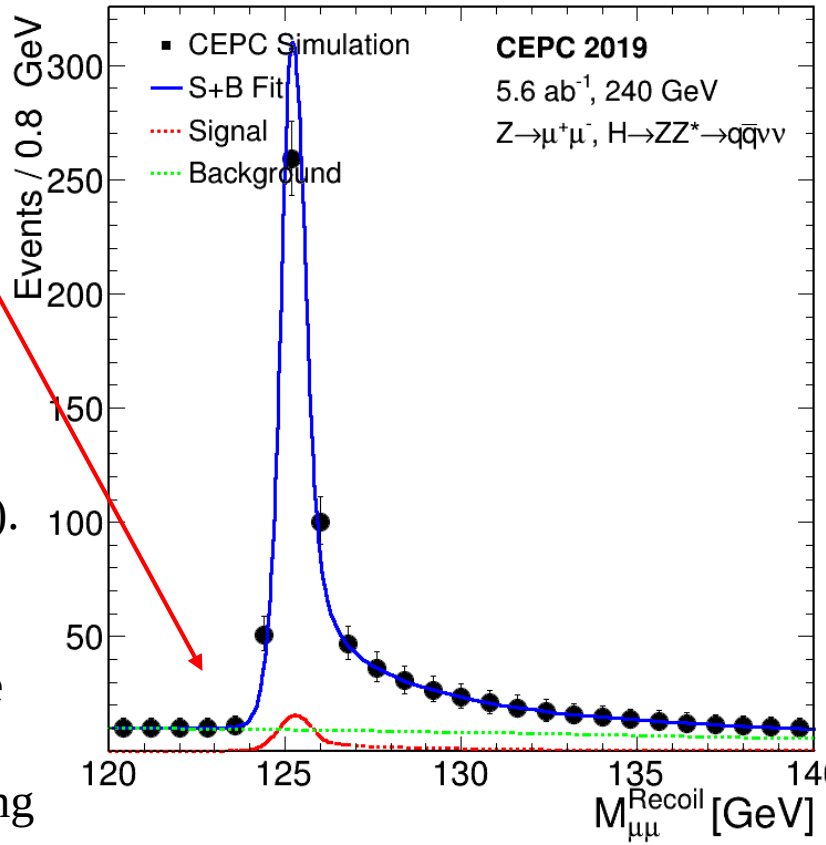
Fitting Discussion

- ***μμHjjνν***

Signal + Background ≠ S+B Fit ?
(Asked by Ryuta)

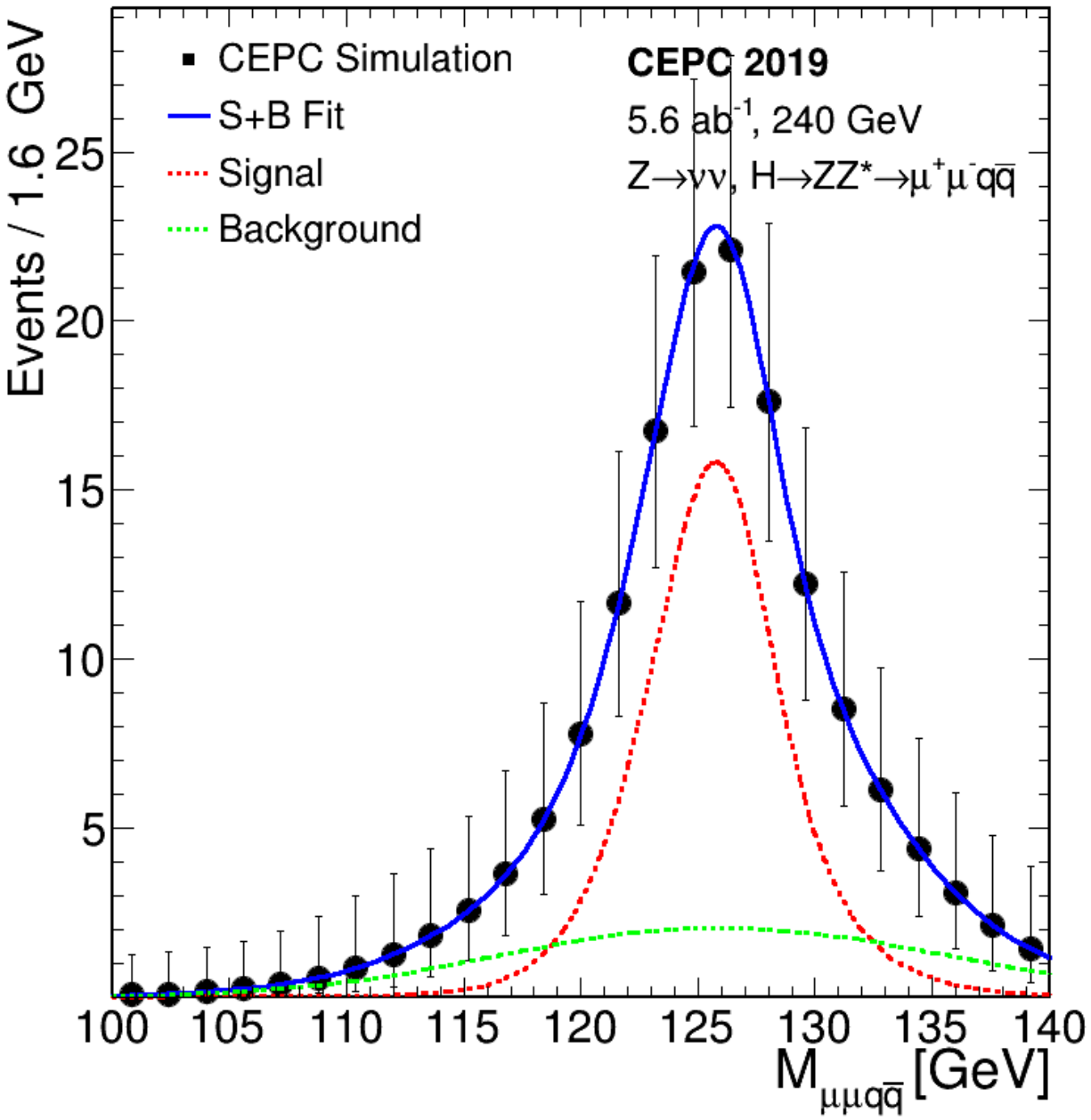
Preliminary Answer:

- The green line "Background" here means SM background
- The red line "Signal" means our signal (here: $\mu\mu Hjj\nu\nu$)
- In "S+B" fit, the signal contains other Higgs processes, such as H->tt, H->WW, H->ZZ(other). These events are considered as signal in Kaili's fitting
- But when we are trying to get the final value, the other Higgs processes are fixed, only the parameter corresponding to our channel is floating



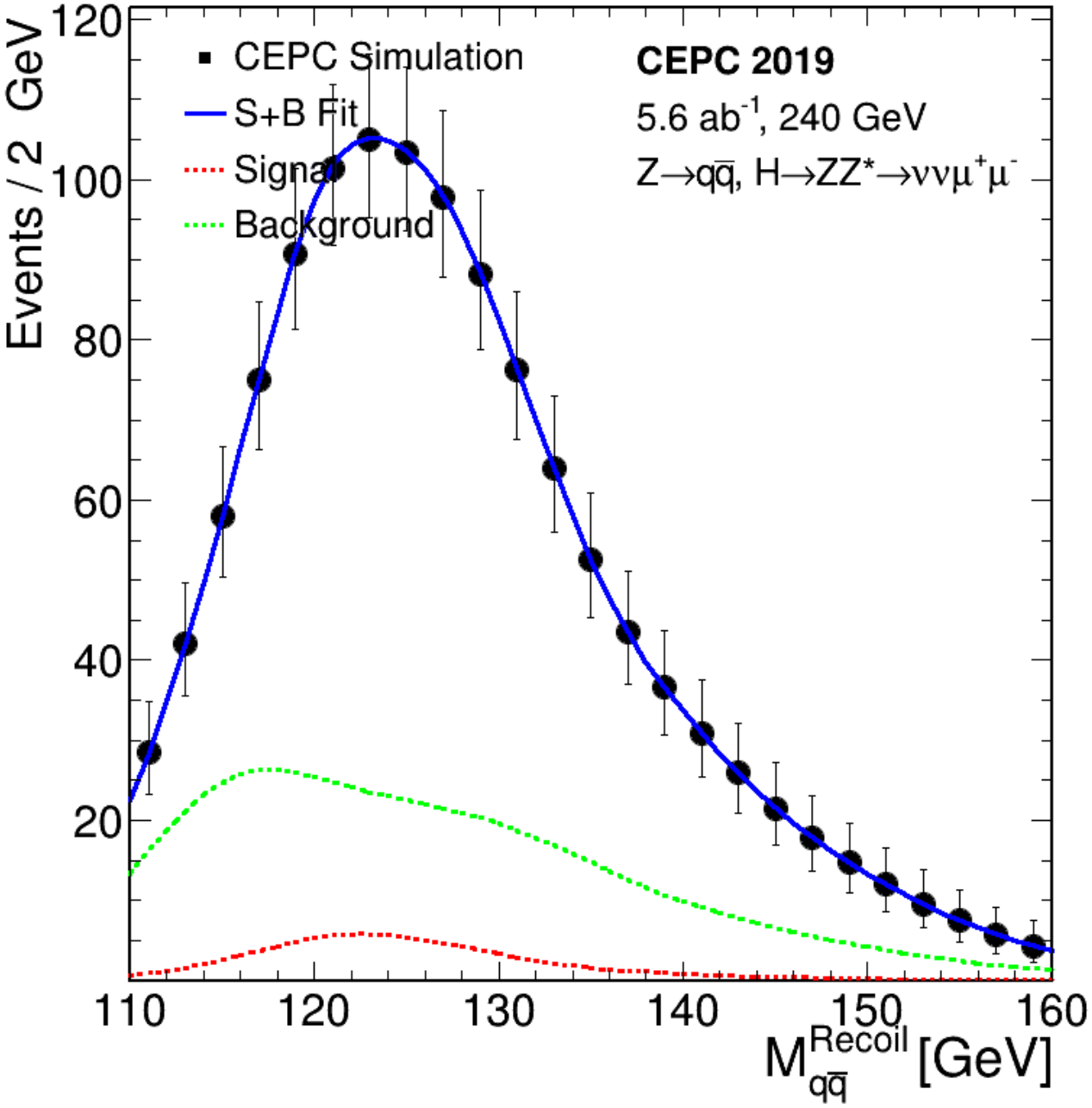
Fitting Progress

- $\nu\nu H\mu\mu jj + \nu\nu Hjj\mu\mu$



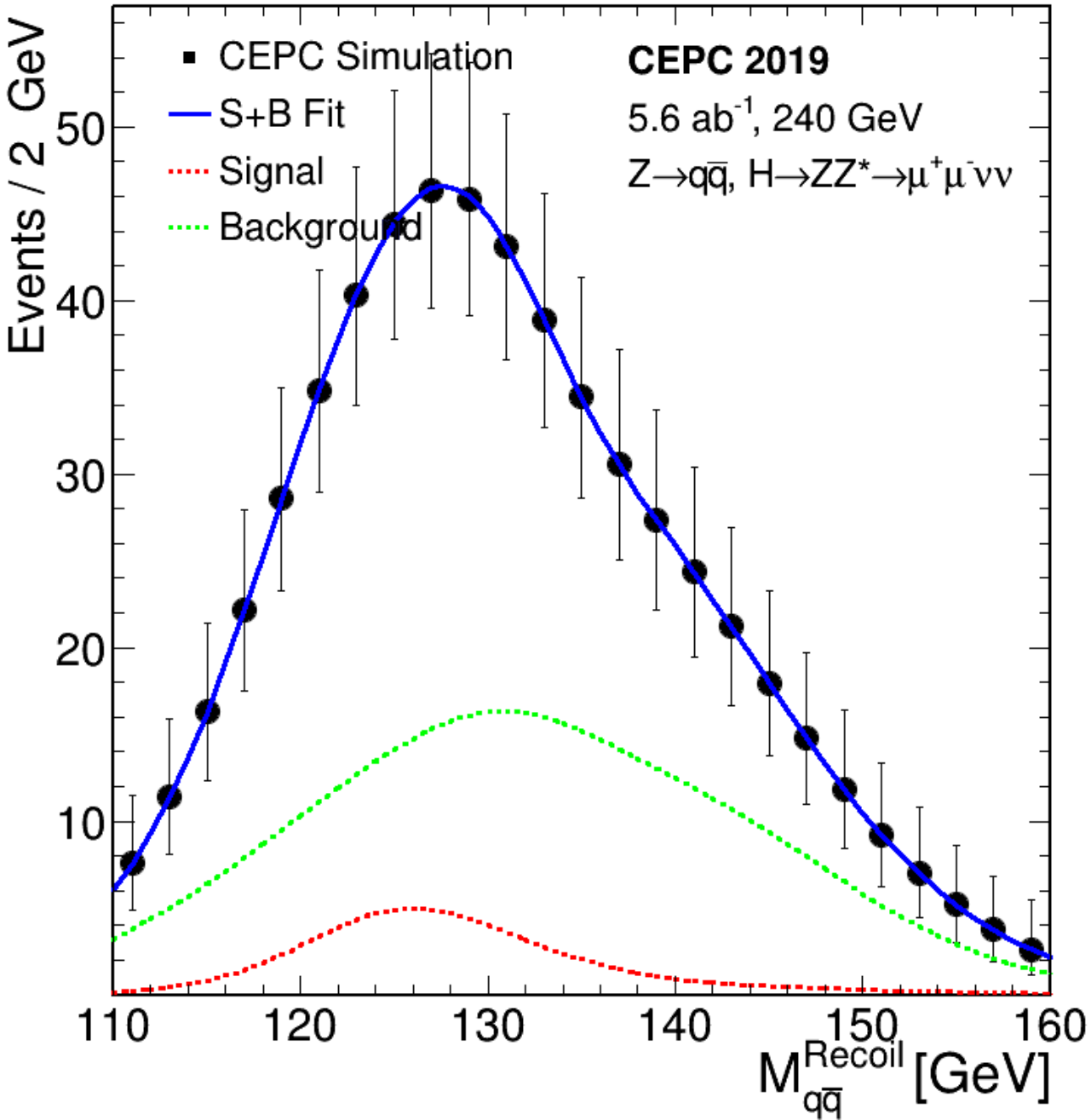
Fitting Progress

- $qqH\nu\nu\mu\mu$



Fitting Progress

- $qqH\mu\mu\nu\nu$



Summary

- Finished the fitting code in the framework, able to run each channel and get results
- $H -> cc$ / $H -> az$ not correctly fitted in $\mu\mu HZZ$ channel, need to be further fixed

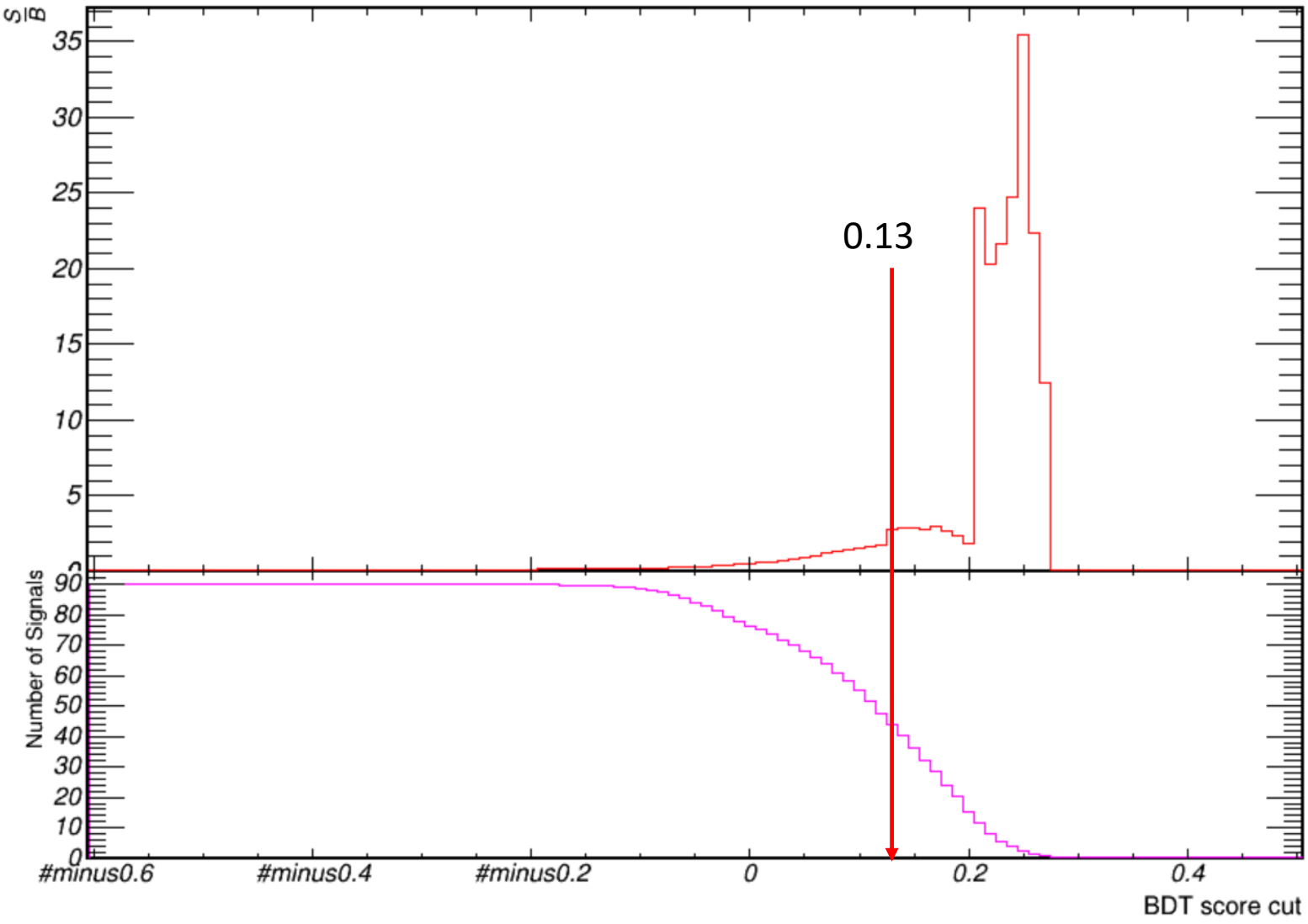
Next to do

- Make combined fitting work in the framework
- Fit the BDT ntuples (mmHvvjj) and decide the best BDT score cut
- Complete BDT study for the other 4 channels
- Optimize the cuts for all 5 channels

Backup

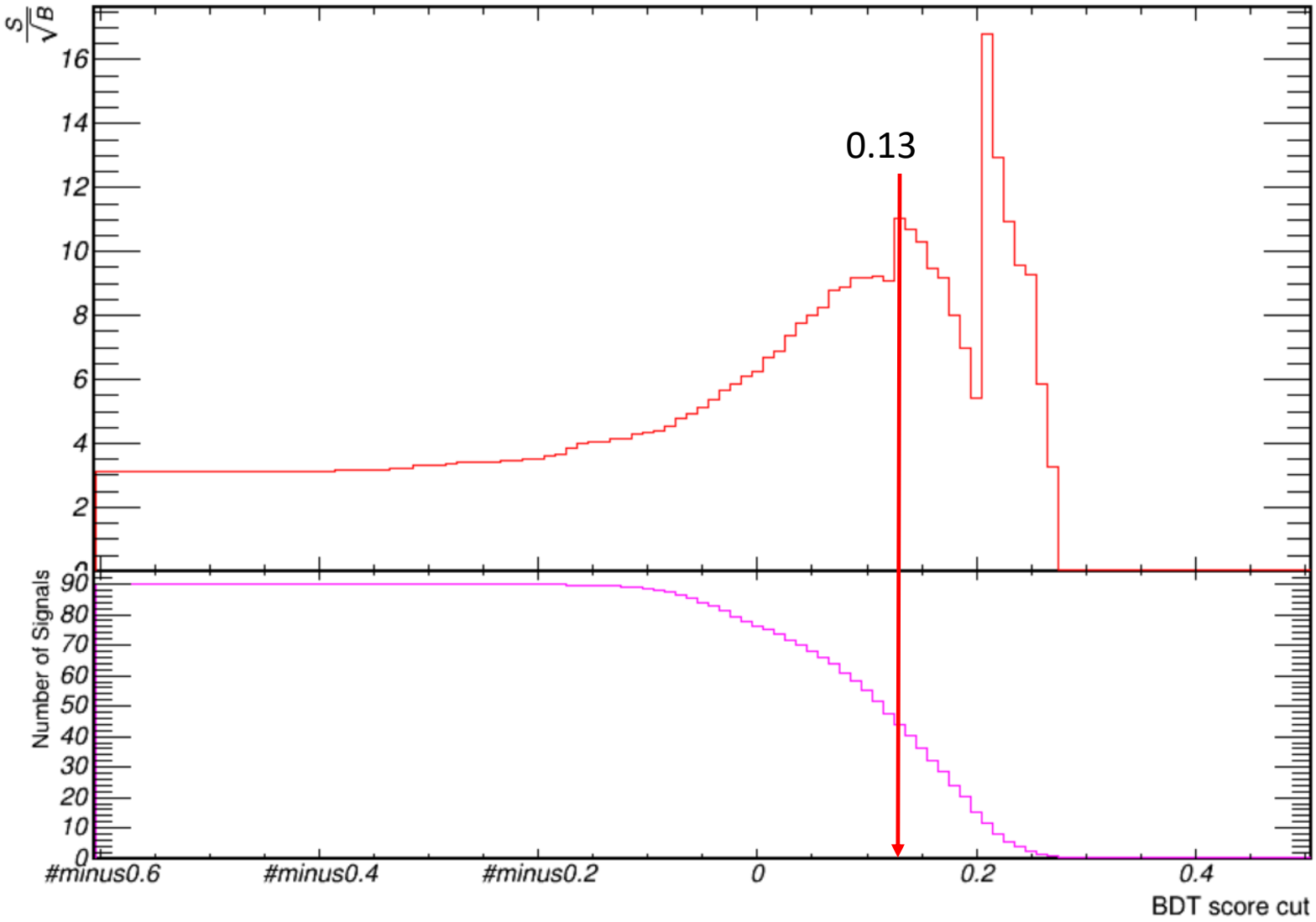
BDT on μμHZZ (vvjj)

- $\frac{S}{B}$



BDT on μμHZZ (vvjj)

- $\frac{S}{\sqrt{B}}$



BDT on μμHZZ (vvjj)

Cut-based

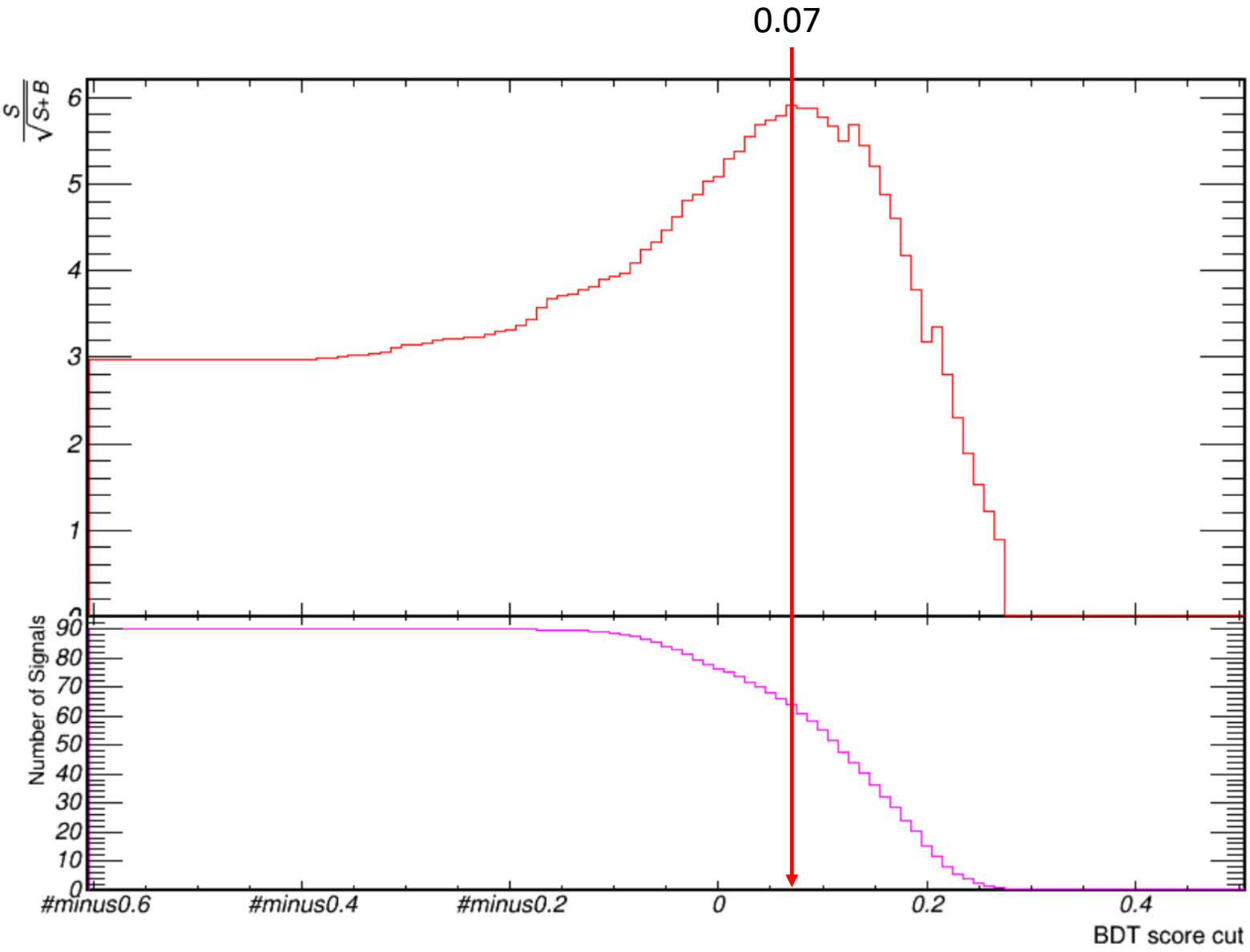
Cut	Signal	ZH background	2f background	4f background
Expected	1000	1140511	801811977	107203890
$Pre-selection$	616	30524	481301	515955
$Signal\ or\ not$	211	30307	481301	515955
$M_{missing} > M_{dijet}$	107	1605	115175	28838
M_{dimuon}	95	726	73813	6836
M^{rec}_{dimuon}	95	707	7894	1360
$N(pfo)$	94	336	3271	574
$Pt_{visible}$	89	312	342	168
$Angle_{min}$	85	298	283	139
$M_{missing}\ and\ M_{dijet}$	62	80	254	46
$Single\ Jet$	54	67	0	9

BDT

Cut	Signal	ZH background	2f background	4f background
$Expected$	1000	1140511	801811977	107203890
$Pre-selection$	616	30494	480828	515424
$Signal\ or\ not$	211	30282	480828	515424
$M_{missing} > M_{dijet}$	107	1608	115062	28811
M_{dimuon}	95	725	73741	6833
M^{rec}_{dimuon}	95	706	7886	1359
$N(pfo)$	94	336	3268	574
$Pt_{visible}$	89	312	342	168
$BDT\ score$	47	10	14	2

BDT on μμHZZ (vvjj)

- $\frac{S}{\sqrt{S+B}}$



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$N(pfo)$	94	336	3268	574
$Pt_{visible}$	89	312	342	168
$BDT\ score$	66	36	14	11