

Summary of the latest Higgs performance meetings

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Towards Krakow workshop



Higgs performance meetings

- Recent Higgs Performance meetings, to follow up on progress of various analyses for Krakow
 - December 6, <https://indico.cern.ch/event/1221257>
 - October 31, <https://indico.cern.ch/event/1207285>
- Another meeting planned before the workshop (second week of January?)

Envisaged Higgs performance talks for Krakow workshop

- 3 Higgs performance talks scheduled: mass/xsec, hadronic, invisible
- Many more Higgs programme/theory talks scheduled
- Call for abstracts

Any new material should be presented before in the Higgs/Physics perf. meeting

Higgs mass and cross-section

Jan Eysermans

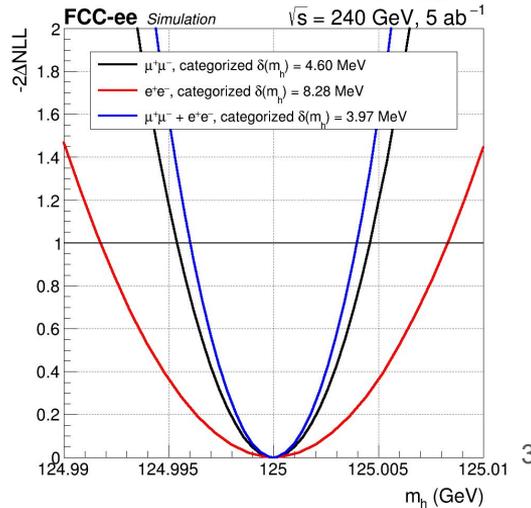
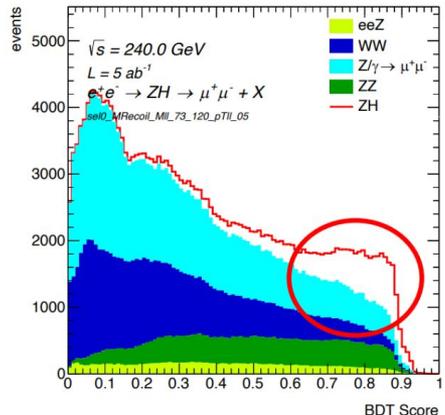
Cross-section analysis

- Ongoing investigations with MVA to replace $\cos(\theta_{\text{miss}})$ cut to preserve decay mode independence
- Updates with preliminary numbers expected next Higgs performance meeting

Mass analysis

- Presented updates on December 6
 - Included electrons (smeared 2x w.r.t. muons)
 - 3-fold categorization based on lepton θ
 - Combined statistical uncertainty ~ 4 MeV
- Systematics (BES, ISR, lepton scale, sqrt(s)) to be re-evaluated

FCCAnalyses: FCC-ee Simulation (Delphes)



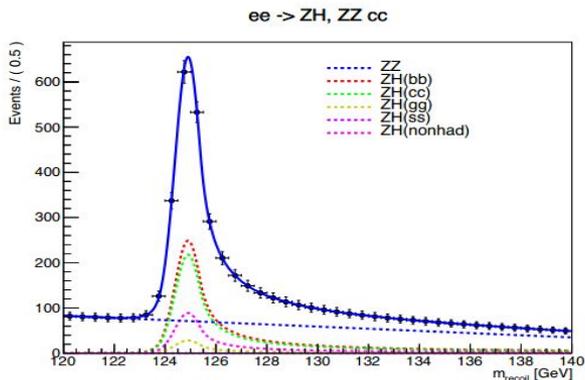
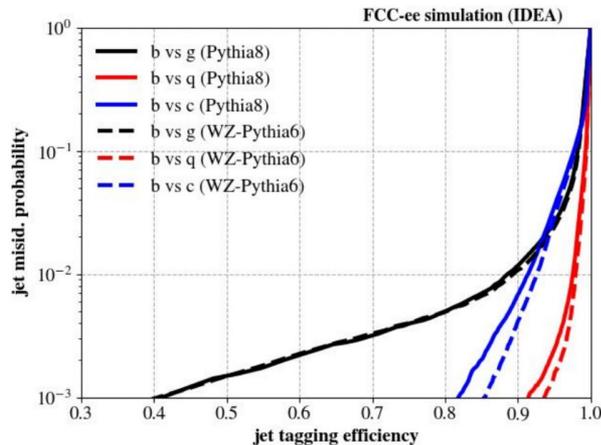
Higgs hadronic couplings

Several efforts depending on final state of Z

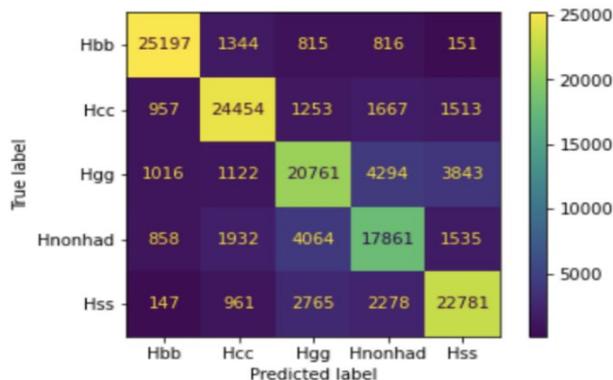
- Analyses using recent developments of flavor tagger (bb/cc/gg/ss)

Z(H)H(qq)

- Updated results presented on Dec. 6 with flavor tagger and MVA for further classification of Higgs decay mode
- Expected stat uncertainty on **bb/cc/gg/ss**: **0.9% - 7.6% - 3.5% - 850%**



Giovanni Marchiori



Higgs hadronic couplings

Andrea Del Vecchio

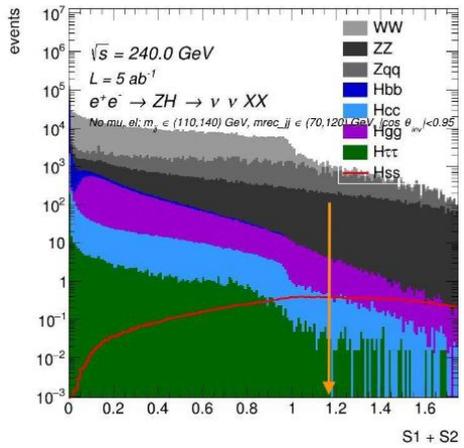
Z(nunu)H(qq)

- Analysis started, preliminary expected unc. **bb/cc/gg: 0.5% - 4.3% - 1.9%**
- First preliminary result on **ss ~ 300%** expected precision

	<i>Hbb</i>	<i>Hcc</i>	<i>Hss</i>		<i>Hgg</i>	<i>Hττ</i>	<i>ZZ</i>	<i>WW</i>	<i>Zqq</i>
	Yield	Yield	Yield	Sig.	Yield	Yield	Yield	Yield	Yield
No cut	$1.18 \cdot 10^5$	$5.84 \cdot 10^3$	51	0.00270	$1.65 \cdot 10^4$	$1.11 \cdot 10^4$	$6.46 \cdot 10^6$	$7.95 \cdot 10^7$	$2.62 \cdot 10^8$
Presel	$4.50 \cdot 10^4$	$3.58 \cdot 10^3$	42	0.0391	$1.42 \cdot 10^4$	$3.79 \cdot 10^2$	$7.31 \cdot 10^4$	$8.75 \cdot 10^5$	$1.58 \cdot 10^5$
$S1 + S2 > 1.17$	0	8	22	0.122	69	1	$8.24 \cdot 10^3$	$6.46 \cdot 10^3$	$1.64 \cdot 10^4$
$M_{jj} \in (123, 127)$	0	5	14	0.167	45	0	$8.55 \cdot 10^2$	$1.40 \cdot 10^3$	$5.12 \cdot 10^3$
$M_{rec,jj} \in (87, 102)$	0	4	12	0.337	38	0	$6.92 \cdot 10^2$	$1.20 \cdot 10^2$	$4.29 \cdot 10^2$
Efficiency	0.	0.001	0.240		0.002	0.000	0.000	0.000	0.000

S/sqrt(S+B)

FCCAnalyses: FCC-ee Simulation (Delphes)

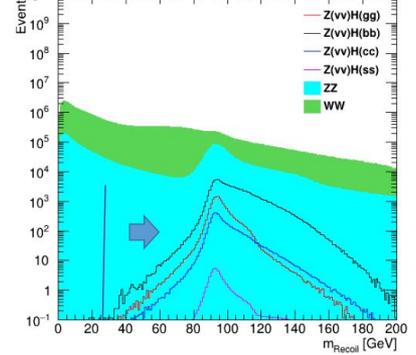


Z(qq)H(qq)

Reham Aly

- Challenging fully hadronic final state, high BR
- Started analysis, first results expected by next meeting

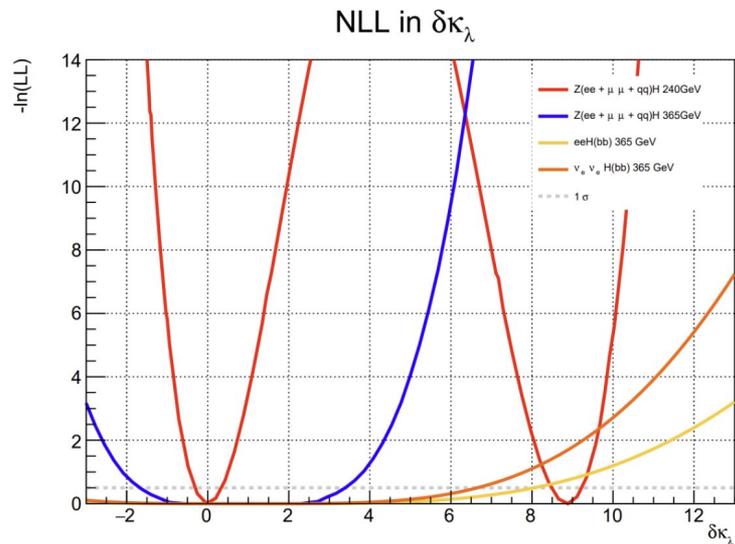
FCCee Simulation



Higgs self-coupling

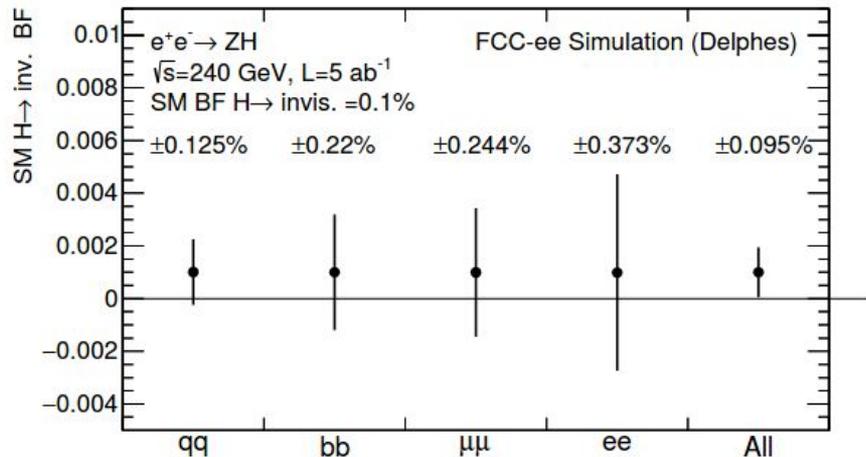
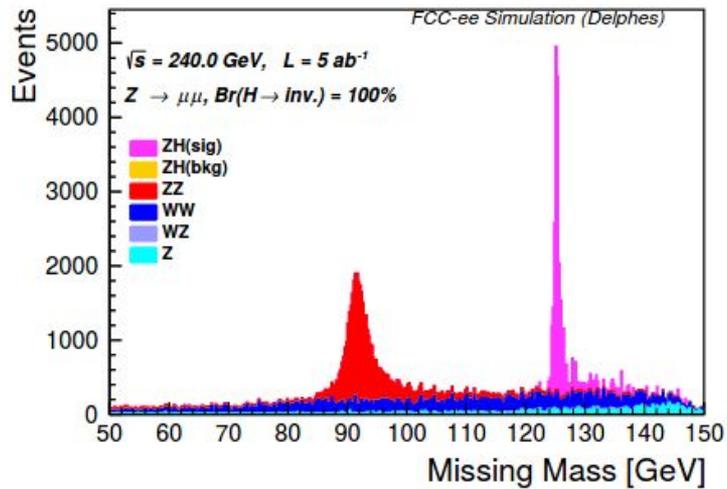
Analysis advanced (thesis) and presented several times in Higgs/Perf. meetings

- Several discussions and iterations on self-coupling fits:
 - discussed the need for a public code for the final fit
 - state of the art fit to self-coupling precision:
 - 19% kl alone vs 33% full (EFT projected) with 2IPs
 - 14% kl alone vs 24% full (EFT projected) with 4IPs
 - “small” discrepancy on $\nu\nu H$ xsec at 365 GeV
 - 0.9% th group vs 4.8% exp group
- To do list (on the exp side):
 - rerun analysis with more up-to-date samples and definitions
 - e.g PFlow visible mass vs anti-kT
 - run fit without exp. systematics
- Update to be expected for Krakow



Higgs invisible/others

- full result available using old samples
- group is working on re-implementing/validating the pre-winter samples



Overview analyses

- Recoil Higgs mass and cross-section analysis (Ang Li, Jan Eysermans, Gregorio bernardi)
- Higgs to invisible (Andrew Mehta, Nikolaos Rompotis)
- Higgs to bb , cc , gg , ss in $Z \rightarrow ll$ final state (Giovanni et al.)
- $Z(\nu\nu)H(jj)$ (Loukas, Andrea, Michele)
- Higgs self-coupling (Roberto Salerno, Roy Lemmon, Nico Harringer)
- $Z(jj)H$, $ZH(jj)$ (Reham, Kunal, Freya)
- $ee \rightarrow H$ (David d'Enterria/Kunal Gautam?)
- Higgs $\mu\mu$ (MIT, also EWK analyses planned)
- Higgs $\gamma\gamma$, $Z\gamma$ (Puebla)
- Anomalous, HZ differential (Juan Alcaraz, Maria Cepeda)
- $H \rightarrow \tau\tau$ (Markus Klute, Xunwu Zuo)

more mature



less mature

Missing:

- Higgs width ($ZH(ZZ)$, 6j: $\nu\nu H(bb)$, $ZH(WW)$): 6j)