

Area 3: Experimental measurements and observables

Eleni Vryonidou



on behalf of Florencia Canelli, Nuno Castro, Pietro Govoni, Andrei Gritsan

EFT WG General Meeting 3/5/21

Experimental measurements and observables

From Outline of WG activities

3. Experimental measurements and observables

How observables relate to operators, which measurements are important for a given operator or set of operators, differential/fiducial measurements vs. dedicated ones, identification of optimal observables, machine learning, re-interpretation vs. static, presentation of results: covariance, multi-D likelihood, etc., compatibility with global fits (i.e. assumptions used in deriving measurement and reporting results).

- Study observable, channel, process sensitivities and complementarities (***)
 - Experimental targets: survey of the sensitive channels and corresponding operators
 - Differential distributions, optimal observables, including machine learning, and dedicated EFT measurements, spin density matrices, EFT-optimized fiducial regions, amplitude analyses, angular distributions (e.g. for CP), pseudo observables, etc.
 - Agreement across experiments (for fiducial regions in particular)
 - What observables are most sensitive to new physics? Exploit energy growing effects, non-interferences, and other TH knowledge
 - Expected uncertainties: sys. or stat. dominated
- Analysis strategies & experimental outputs, also with a view at legacy measurements and their possible reinterpretation (***)
 - Dedicated EFT extractions by collaborations
 - Differential measurements and the best choice of observables for re-interpretation.
 - Presentation of measurements: cross sections, correlations/covariance, multi-D likelihood, etc...
 - Experimental systematics related to EFT (e.g. accounting for detector effects)
 - Detector effects: unfolding, forward folding, efficiency maps, recasting through reweighting, etc.
 - EFT in backgrounds: final-state driven instead of sig-bgd, statistical model (***)

Kickoff Meeting

11 January

Area 3 meeting: experimental measurements and observables

Monday 11 Jan 2021, 14:00 → 18:00 Europe/Zurich

Andrei Gritsan (Johns Hopkins University (US)), Eleni Vryonidou, Florencia Canelli (Universitaet Zuerich (CH)), Nuno Castro (LIP and University of Minho (PT)), Pietro Govoni (Universita & INFN, Milano-Bicocca (IT))

Description The agenda of this meeting is under construction. The meeting will be held online via zoom.

Videoconference Rooms Area 3 meeting: experimental measurements and observables [Join](#)

There are minutes attached to this event. [Show them.](#)

14:00 → 14:10 Introduction: setting goals for the meeting 10m

Speakers: Florencia Canelli (Universitaet Zuerich (CH)), Nuno Castro (LIP and University of Minho (PT))

LHCEFTWG-Area3-l...

14:15 → 14:40 Inclusive, fiducial, and differential measurements in application to EFT 25m

Speaker: James William Howarth (University of Glasgow (GB))

area3-lhceftwg-hor... LHCEFTWG_Obser...

14:45 → 15:05 Current approach with dedicated EFT measurements 20m

Speaker: Pietro Govoni (Universita & INFN, Milano-Bicocca (IT))

2021-01-11-EFT.pdf govoni-area3-LHCE...

15:10 → 15:30 MELA: matrix element inspired approach for EFT measurements 20m

Speaker: Ulascan Sarica (Univ. of California Santa Barbara (US))

20210111.pdf sarica-area3-LHCW...

15:35 → 15:55 MadMiner: Machine learning-based inference for particle physics 20m

Speaker: Kyle Stuart Cranmer (New York University (US))

cranmer-area3-LHC... EFT-2020.pdf

16:00 → 16:20 Break 20m

16:20 → 16:45 Fitting EFT models with experimental measurements in the Top Physics 25m

Speaker: Cen Zhang (Institute of High Energy Physics, Chinese Academy Sciences)

talk.pdf zhang-area3-LHCE...

16:50 → 17:15 Fitting EFT models with experimental measurements in the Higgs and EW Physics 25m

Speaker: Tiann Tevong You (Imperial College Sci., Tech. & Med. (GB))

Higgs and Electrow... you-area3-LHCEFT...

17:20 → 17:40 Summary of questions from experiment to theory and theory to experiment 20m

Speakers: Andrei Gritsan (Johns Hopkins University (US)), Eleni Vryonidou

summary-area3-LH... talk_EFTArea3.pdf

17:40 → 18:00 Discussion 20m

Speaker: All

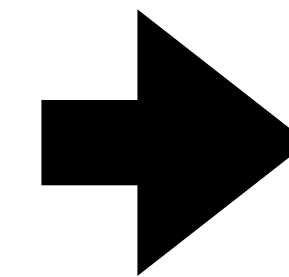
<https://indico.cern.ch/event/971725/>

See also Area 3+4 joint meeting
<https://indico.cern.ch/event/1007581/>

Topics addressed

Different approaches for EFT interpretations of experimental measurements

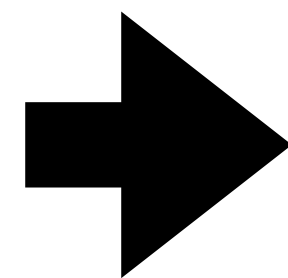
- Inclusive, fiducial, differential measurements
- Dedicated EFT measurements
- Matrix Element Method
- Machine learning



Survey of currently used approaches

Input from theory global fits

- Higgs+EW
- Top



Observables used in global fits and corresponding operators

Write up

Preliminary

LHC EFT WG Report in Area 3:
Experimental Measurements and Observables

Editors: Florencia Canelli^{1,b}, Nuno Castro^{2,c}, Pietro Govoni^{3,d}, Andrei Gritsan^{4,e}, Eleni Vryonidou^{5,f}, many others...

¹ University of Zuerich,

² LIP and University of Minho,

³ University & INFN, Milano-Bicocca,

⁴ Johns Hopkins University, Baltimore, MD, USA

⁵ University of Manchester, Oxford Road, Manchester M13 9PL, United Kingdom

Chapter 2

Survey of the sensitive channels and corresponding operators

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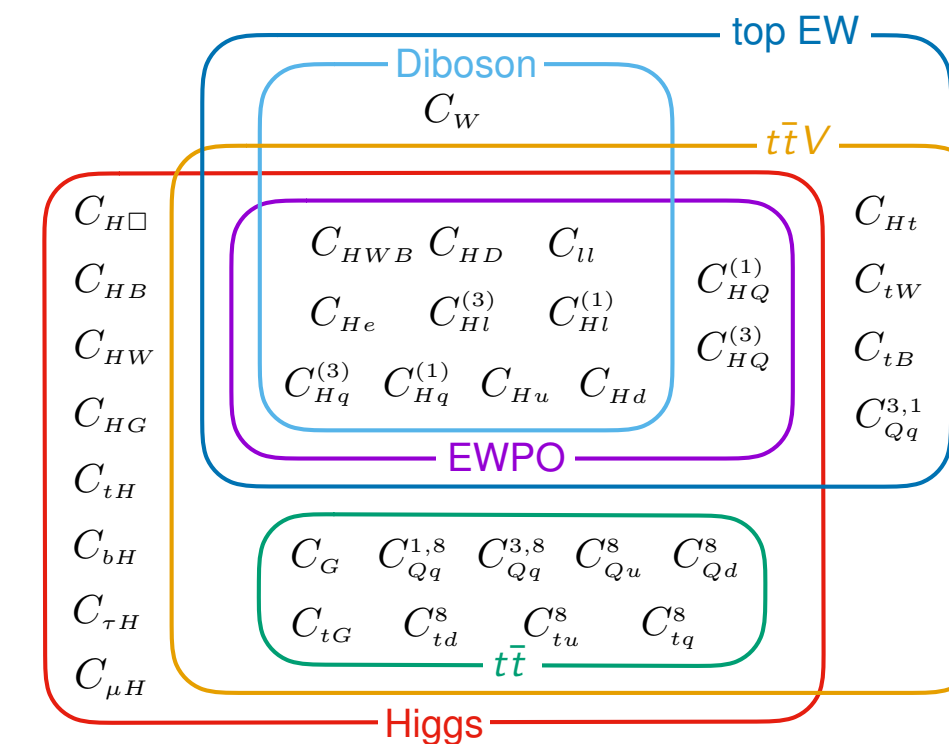


Figure 2.1: Schematic representation of the datasets and their overlapping dependences on the 34 Wilson coefficients included in the analysis of Ref. [1]

Contributions welcome!

Future Plans

More work on the write-up

- establish a detailed map between EFT operators and experimental observables
- determine relative sensitivity of observables to operators
- performing experimental measurements & interpretations: pros and cons of various analyses techniques

Input welcome from both theory and experiment