

Les Houches Workshop Series

"Physics at TeV Colliders" 2015

Session: 1-19 June



Ce n'est qu'un au revoir
The Organisers

AULD LANG SYNE
WE'LL MEET AGAIN



SESSION 2



Les Houches Spirit?



Les Houches Spirit





Les Houches Spirit



Work Done?

The meeting will consist of two sessions. The first session will concern precision physics, in particular it will cover topics related to improving precision on SM observables. The second session will focus on the search of New Physics, model building, data interpretation and analysis. There will be a strong **interplay and collaboration between the different groups** and the topics to be covered by different working groups making a separation somewhat artificial.

**Workshop is not over yet
just started...**

cs, in particular it will cover topics related to improving precision on SM observables. The second session will focus on the search of New Physics, model building, data interpretation and analysis. There will be a strong interplay and collaboration between the different groups and the topics to be covered by different working groups making a separation somewhat artificial.

The projects are to start in January 2015 and should be completed by the end of the year 2015.

The [list of topics](#) will be updated regularly and a more detailed plan of work will be posted on the [wiki pages](#). The wiki pages will also be the forum for exchanging ideas and contributing to the working groups of PhysTeV 2015 even if you are not attending the meeting in Les Houches. **We encourage you to actively contribute to the wiki pages.**

Session 1: 1-10 June 2015

Main topics are progress in NLO multi-leg calculations and techniques, and NNLO computations. More generally this session covers issues related to precision physics and better understanding of the background and of standard models processes, in particular their implementations in tools and Monte-Carlos (e.g MC vs. NLO connections). The importance of electroweak corrections is another example of topics to be addressed in this session. Related to all these issues is the prediction and improvement of search techniques and methods as concerns the Higgs. Physics of jets, notably jet substructure, boosted objects and reducing uncertainties of binned jet predictions, will also be addressed in this session. **See list of topics [here](#).**

Higgs: SM Issues

Theory

M. Grazzini, Universität Zürich, Switzerland
C. Williams, SUNY Buffalo, USA

Experiment

K. Tackmann (ATLAS), DESY Hamburg, Germany
J. Bendavid (CMS), CERN, Switzerland

SM: Loops and Multilegs

Theory

A. Denner, Universität Würzburg, Germany
S. Badger, CERN, Switzerland
Jets contact: J. Thaler, MIT, USA

Experiment

J. Huston (ATLAS), Michigan State University, USA

Tools and Monte-Carlos

Theory

R. Frederix, CERN, Switzerland
M. Schoenherr, UZH, Switzerland

Experiment

V. Ciulli (CMS), Firenze University and INFN, Italy

Next: create transparencies for Gustaaf by end of June 18. Put link to slide in this document in the section “Draft Slides for Les Houches Presentation June 18, 2015”

Proceedings: topical drafts within the Dijet Resonances group due in November to allow time for “harmonization” before the final Proceedings deadline

[Participants](#)

[Overview](#)

[Benchmark Models in the Literature](#)

[Physical Properties of Resonance to be Determined](#)

[Potential Experimental Measurements: Single Production](#)

[Potential Experimental Measurements: Pair Production](#)

[Possible Projects to work on at Les Houches](#)

[Updated Question List June 15](#)

[Working Models for Les Houches](#)

[Preliminary Investigation of Azimuthal Decorrelation in Dijet Resonance Production](#)

[Color Singlet vs. Octet Vectors via Additional Jet \$p_T\$](#)

[Some Phenomenology References](#)

[Some Recent Relevant LHC Papers](#)

[Experimental handles for model discrimination](#)

[Images](#)

[Draft Slides for Les Houches Presentation June 18, 2015](#)

Participants

Thursday, June 11: Gustaaf Brooijmans, R. Sekhar Chivukula, Thomas Flacke, David

Discussion on Differential Higgs Cross Section Measurements

If you are interested in contributing please [sign up here](#).

- Discussion focused on $H \rightarrow \gamma\gamma$ and $H \rightarrow 4\text{leptons}$ (and $H \rightarrow WW$)
- Currently available measurements:
 - ATLAS $H \rightarrow \gamma\gamma$: <http://arxiv.org/abs/1407.4222>
(<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/HIGG-2013-10/>)
 - ATLAS $H \rightarrow 4\text{leptons}$: <http://arxiv.org/abs/1408.3226>
(<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/HIGG-2013-22/>)
 - ATLAS combination of $H \rightarrow \gamma\gamma$ and $H \rightarrow 4\text{leptons}$: <http://arxiv.org/abs/1504.05833>
(<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/HIGG-2014-11/>)
 - Results from will hopefully be available soon.
- What would be other useful observables and/or corners of phase space that are not currently measured by the experiments?
 - Inclusive variables
 - p_T with a finer binning especially in the low p_T range once possible
 - ϕ^* probes the low p_T phase space region in a different way (experimental resolution should be better for $H \rightarrow 4\text{leptons}$; $H \rightarrow \gamma\gamma$ to be checked)
 - p_{Tt} (redundant with ϕ^* , check which one can be measured better)
 - 0-jet resolution variables (currently measured: p_{Tj} , TauCj)
 - Tau(C)j (lower p_{Tj} cut important)
 - Tau0
 - 1-jet resolution variables for $p_{Tj1}/p_T(H)/\text{Tauj1} > \text{cut}$ for different cuts (30, 50, 100)
 - p_{Tj1}/p_{Tj2} more differentially
 - $p_T(H\text{-system})$
 - $\phi(H\text{-j})$
 - $\text{Tau1}_{jetmass}$

LH Accords, Discords, Proposals, Wishlists

Discussion on Pseudo Observables/Cross Sections for Higgs Measurements

If you are interested in contributing, please sign up [here](#).

Goal:

Define “pseudo-cross sections” as general framework for Higgs measurements and combination of decay channels.

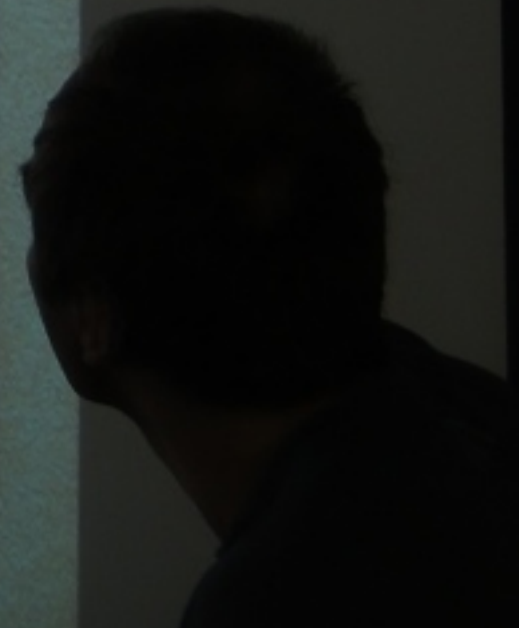
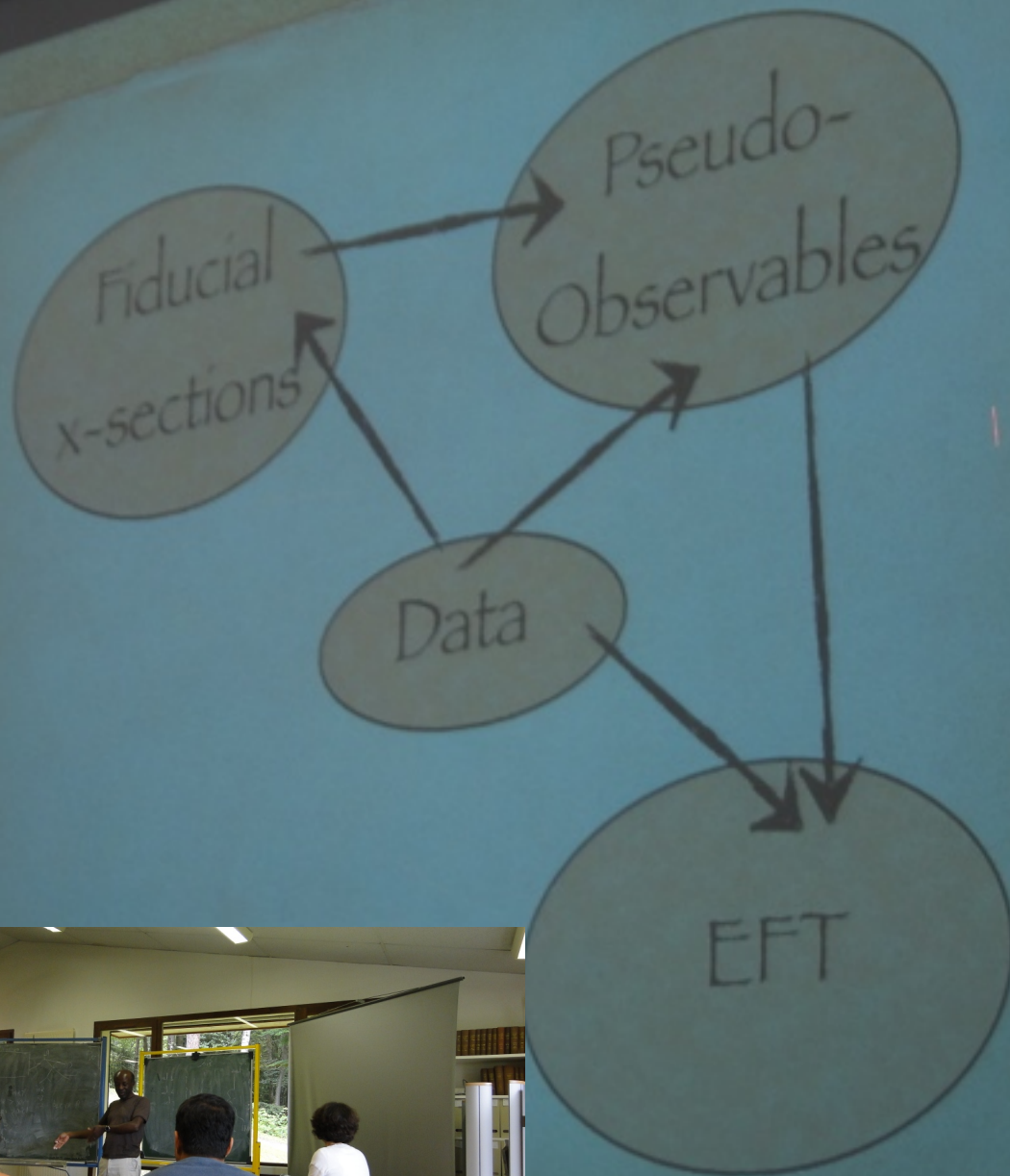
- Provide “measurement interface” between raw experimental categories and final interpretation.
- Can think of these as “differential/fiducial μ ” per production channel, but normalized as cross sections (i.e., without dividing by SM predictions)
- Ensure long shelf life of experimental measurements
- Minimize theory dependence (theory systematics and model dependence) in measurements.
- Can then be interpreted in SM (analogous to current μ fits) or different BSM scenarios (Higgs-EFTs or specific models)

Guiding principles for definition of pseudo-cross sections:

- Should be reasonably well constrained/measured
- Important to think which phase-space regions are important to separate out from the theory side
 - where are largest theory systematics (e.g. ggF 0jet bin)
 - BSM sensitivity/interpretation (e.g. EFT breaks down at high energy).

♦ Discussion on Pseudo Observables/Cross Sections for Higgs Measurements

- ♦ Goal:
- ♦ Guiding principles for definition of pseudo-cross sections:
- ♦ 1st iteration
- ♦ 2nd iteration



WIKI

All of you have an account

start

Login

You are currently not logged in! Enter your authentication credentials below to log in. You need to have cookies enabled to log in.

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Username

Password

Remember me

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start

boudjema

Send new password

Please enter your user name in the form below to request a new password for your account in this wiki. A confirmation link will be sent to your registered email address.

Set new password for

Username





Les Houches

- [Website](#)
- [Wiki](#)
- [Contact](#)

2015 Session

- [Home](#)
- [Topics for Consideration](#)
- [Programme in Les Houches](#)
- [Working Groups & Topics](#)
 - [Higgs](#)
 - [SM: Loops and Multilegs](#)
 - [New Physics](#)
 - [Tools and Monte-Carlos](#)
 - [Topics Signup Pages](#)
 - [Topics for Session 1](#)
- [Conveners and Organisers \(Restricted Access\)](#)
- [Participants \(Restricted Access\)](#)

Tools and Monte Carlo Working Group

Background subtraction in fiducial measurements

$t\bar{t}$ +jets measurements

V+b(b) measurements

NLO EWK corrections (joint with SM)

Study of the validity of different pQCD approximations for non-trivial observables in $pp \rightarrow h + \text{jets}$ (ggF)

Shower and Matching Uncertainties

PROCEEDINGS

PROCEEDINGS

- Deadline **31 December 2015**
- Page guide (email the relevant coordinator for queries regarding your submission)
- The conveners will send a mail asking for statements of interest, coordinating the efforts and page length etc. Some topics will be collected in a single contribution with a contact person to be chosen by the conveners.
- Coordination between WG's essential / Sign up lists
- Authors list: not all participants in Les Houches can sign as authors. The author list will also have contributions from those taking part in the activities of the Workshop from people who were not present in Les Houches.
- **Please do not submit a copy of your sub contribution to the archives (unless it's in an expanded form for a paper of course!)**

Connecting with LHCXSWG write-up

THE WEATHER



Friday, June 19, 15



Friday, June 19, 15

THE FOOD

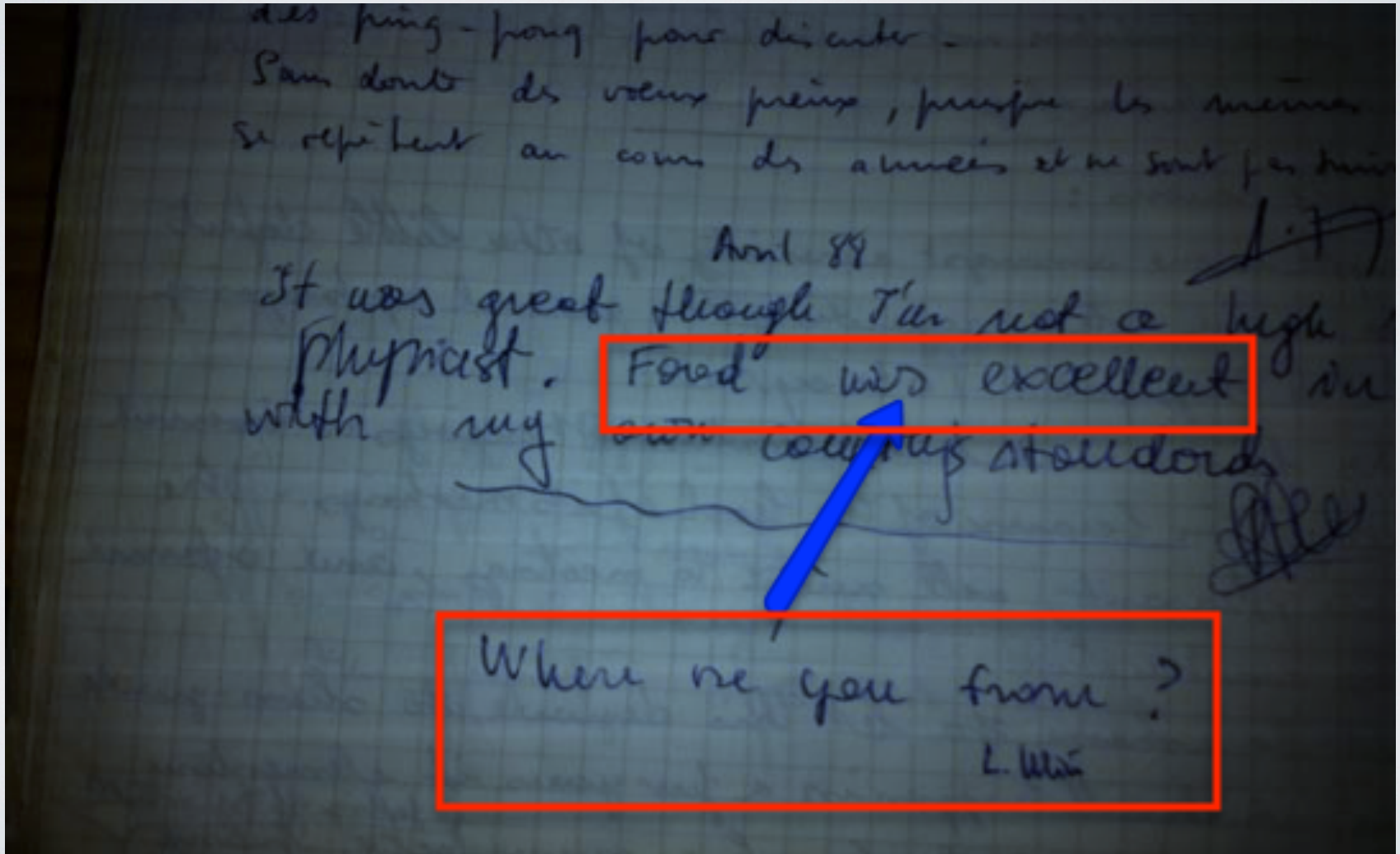
FOOD HAS IMPROVED

ASK THOSE WHO HAVE BEEN COMING HERE FOR YEARS



FOOD HAS IMPROVED!

ASK THOSE WHO HAVE BEEN COMING HERE FOR YEARS



- **Please a few comments and words of encouragement to the cooks**
- **There is a booklet in the restaurant**

NETWORK & PRINTING

1. EDUROAM

2. WIFI CAMPUS

House & Home

Home	World	Companies	Markets	Global Economy	Lex	Commentary		
Arts ▾	FT Magazine ▾	Food & Drink ▾	House & Home	Style	Books ▾	Pursuits ▾	Travel ▾	Columnists

Country house guests now regard WiFi as more important than staff, The importance of a gizmo-friendly bathroom with WiFi



By David Tang

Should homes be redesigned to anticipate a changing world? Excellent internet access is key

Sir David Tang, entrepreneur and founder of ICorrect, offers advice on questions about property, interiors – and modern manners for globetrotters

In view of the ever-changing internet world, should there be design elements for homes, whether newly built or not, to anticipate a changing world of living?

I would concentrate on the bathroom and make it larger and soften it with pieces of furniture and dispense with, as much as possible, all the hard surfaces like marble floors or tiling walls. The reason is because, increasingly, people are going to spend

EDITOR

VIDEO



Jane Ov
Flower S
anniver:

MOST P

QUESTIONNAIRE(S)

Evaluation

7. In your opinion which were the good and bad points of the Workshop?

7a) Good Points

7b) Bad Points

**Please fill in the
questionnaire**

8. Which are the educational methods (lectures, discussion groups, practical work, ...) proposed during this workshop?

9. Which of the following occasions provided a better environment for exchanges with the participants and the conver

a) Plenary sessions

b) Working groups

c) Meals

d) Other(s), specify :

10. Would you like this series of workshops to continue?

If yes,

• With the same format?

• On what subject/topic(s)?

• For which audience?

11 . Network, Computing

SHARE YOUR PICS

 Picasa™ Albums Web

Découverte

Galerie de Phys TeV

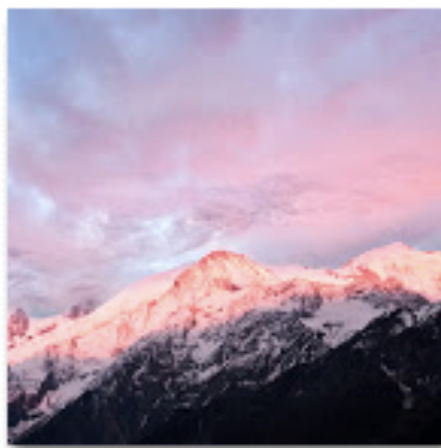
Galerie de Phys TeV Albums (3)



Jon Session 1

9 juin 2013

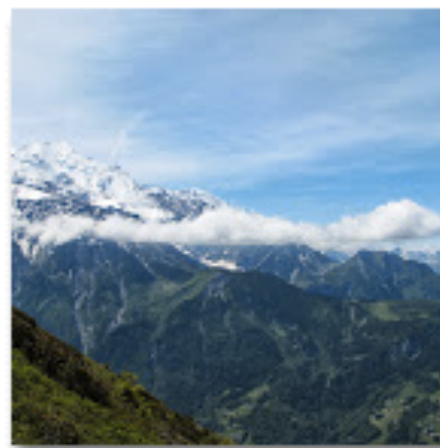
 photos : 6



AK

7 juin 2013

 photos : 4



Session 1, Fawzi

1 juin 2013

 photos : 14

We now have a facebook account for LH. Thanks Bjoern

- Empty your pigeon hole (flash light, black book are presents)
- Certificate of Attendance
- Talks and Presentation: put them on the wiki
- Pay for the soft drinks in Jacassière

LH 2015 THEME(S)

LH 2015 Theme "Lumberjack"

🌐 LH 2015 Higgs-Countersong "What a Swonderful World"

LH 2015 Theme "Hey Jude" proposal by Luca (with Lyrics and Chords) ← (Session 1) It's too difficult to sing!!!

LH 2015 "All About The Higgs", the official session 1

Daniel:

```
Oh I'm a physicist and I'm okay  
I work all night and I work all day
```

Mounties:

```
He's a physicist and he's okay  
He works all night and works all day
```

Aoife:

```
I write accords and I write new tools  
I enjoy four-course meals  
On Sundays I go hiking  
On mountains I make deals
```

Mounties:

```
She writes accords and she writes new tools  
She enjoys four-course meals
```


LH 2015 Theme "Lumberjack"

🌐 LH 2015 Higgs-Countersong "What a Swonderful World"

LH 2015 Theme "Hey Jude" proposal by Luca (with Lyrics and Chords) ← (Session 1) It's too difficult to sing!!!

LH 2015 "All About The Higgs", the official session 1

LH 2017

- **5-23 June 2017**
- Spread the word, the dates. Avoid clash with other important (RADCOR,..)
- Work on Jacassière in 2016
-

THANKS/ SESSION I

- Björn, Pietro, Geneviève, Nicolas, Sabine, Dirk, Jean-Philippe, Diego
- Secretariat in LH (Flora, Isabel, Murielle) and at LAPTh (Dominique, Virginie)
- Computer people at LAPTh and LAPP (Mathieu and Sylvain)
- Conveners
- All of you!