

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 I



Les Houches Spirit?



Les Houches Spirit





Les Houches Spirit



Wednesday, June 10, 15

What is a Quark Jet?

From lunch/dinner discussions

Work Done?

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

The meeting will consist of two sessions. The first session will concern topics related to improving precision on SM observables. The second session will cover 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.

cs, in particular it will cover the signal and its impact in the search. In addition, we expect a very high level of similar activities will

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 a 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

Les Houches Session 1 Topics Signup Pages

Please sign up for the topics you are interested in (discussed in the June 2 afternoon discussion) by clicking on the desired page(s) below. Many of these topics are intergroup. The "fiducial" topic will be addressed also in the second session

- Fiducial Cross sections (includes: background subtractions, WW-->extrapolation and backgrounds, normalization, interesting observables (e.g. for Higgs), what is meant by inclusive?)
- Higgs + jets (includes: comparison to fixed order, substructure/jet shape (e.g. trimmed jets))
- Precision comparisons for W + jets
- W/Z + b jets--5-flavor vs 4-flavor
- ttbar + jets
- PS + matching uncertainties
- PDFs (includes: accord, special PDF directions, theory uncertainties, N3LO PDFs+ uncertainties, EW corrections..)
- Photon isolation
- Higgs pt: Reweighting, uncertainties,....
- White whale (includes: jet radius variation, wishlist of jet shapes, quark/gluon separation)
- Scale choice (includes: $H_t/2$, Γ/Z)
- Review of the Wishlist
- Propagation of NNLO results
- Automation of EW corrections, comparisons
- W mass
- Uncertainties in ggF cross section
- Off-shell effects in Higgs studies

Updating the wish-list for precision theory predictions

Summary of the discussion from 5th June

Aims:

1. Update the 2013 list to include the current state-of-the-art
2. Attempt to quantify the necessary precision for the LHC13 processes considering specific observables
3. Identify key measurements and summarize the potential experimental precision

H(+jets)

- Higgs p_T - resummation of NNLO (N3LL?)
- jet veto - resummation of NNLO
- how important is full m_t/m_b dependence at NNLO - importance for boosted Higgs analyses, high p_T
 - what can we learn from [Hamilton et al. 1501.04637?](#)
- full m_b dependence could be more important for top/bottom interference
- QED+QCD at NNLO - important high p_T , boosted analyses (what is the state-of-the-art here? can we estimate the size of the missing corrections)

top

- top mass measurements: threshold resummed NNLO?

W

- W mass measurements (expected experimental accuracy?)
- W p_T - resummation at N3LL for W mass measurements?

WW

- resummation for p_T and jet vetos in $W^+ W^-$

General requests

- specify the details of top decays - NWA etc.
- should more processes be requested at NNLO+PS?

So there is a small but noticeable effect. The main contributions to the systematic errors quoted in the paper are:

- Jet energy scale 10-50%
- ISR/FSR, including on single top and ttbar 2-30%
- b-tagging 1-8%
- MC modelling (but only of the Wb "signal") 2-8%

So I guess the fact that JES dominates is why the effect is fairly small. The "ISR/FSR" thing, which should be reduced for the unsubtracted measurement, varies a lot with jet pT. Indeed, if you compare Table 4 with Table 9 in the paper, you can see this. In the highest pT bin the systematic uncertainty goes from 16% before subtraction to to 54% after it.

github instructions

To setup your local repository

1. go to github.com and get an account
2. log in, go to https://github.com/perrozzi/leshouches_bkgsb
3. In the top-right corner of the page, click Fork
4. open a shell where git is available
5. clone the repository with the command: `git clone git@github.com:your_git_username/leshouches_bkgsb.git`
6. enjoy

To start contributing

1. modify/add a file
2. add file(s) to local repository: `git add filename.bla`
3. commit file(s) to local repository: `git commit -m "commit message" filename.bla`
4. "push" modifications to your remote (i.e. github) repository : `git push`
5. inform Luca to include your modifications to the main repository

To synch your repository with the main repository

1. `git pull https://github.com/perrozzi/leshouches_bkgsb.git master`

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.

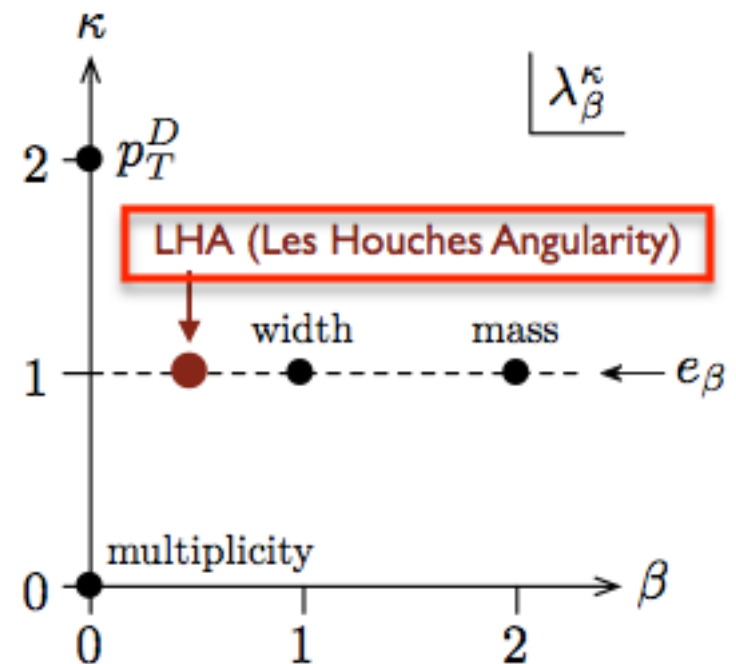
- Provide “measurement interface” between raw ex
- Can think of these as “differential/fiducial mu” per sections (i.e., without dividing by SM predictions)
- Ensure long shelf life of experimental measureme
- Minimize theory dependence (theory systematics
- Can then be interpreted in SM (analogous to curr or specific models)

Guiding principles for definition of pseudo-cros

- Should be reasonably well constrained/measured
- Important to think which phase-space regions are
 - where are largest theory systematics (e.g. ggF
 - BSM sensitivity/interpretation (e.g. EFT breaks

♦ Discussion on Pseudo Observables/Cross Sections for Higgs Measurements

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



History of wishlist

- Les Houches 2005: **construction of NLO QCD wishlist**
- amended at Les Houches 2007 and 2009
- Les Houches 2011: progress in NLO automation
⇒ no need for NLO wishlist
instead: **NNLO wishlist** with few processes of high priority
- Les Houches 2013: **ambitious high-precision wishlist**
including NNLO (N^3 LO) QCD, NLO EW, resummation

Les Houches 2015

- NLO EW automation upcoming
- large progress in NNLO QCD calculation
(example: N-jettiness subtraction ⇒ **talk by Petriello**)

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.

Login

Username

Password

Remember me

Forgotten your password? Get a new one: [Set new password](#)



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

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 - [Topics for Session 1](#)
- [Conveners and Organisers \(Restricted Access\)](#)
- [Participants \(Restricted Access\)](#)

Tools and Monte Carlo Working Group

Background subtraction in fiducial measurements

ttbar+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->h+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!)**

THE WEATHER



Wednesday, June 10, 15



Wednesday, June 10, 15

THE FOOD

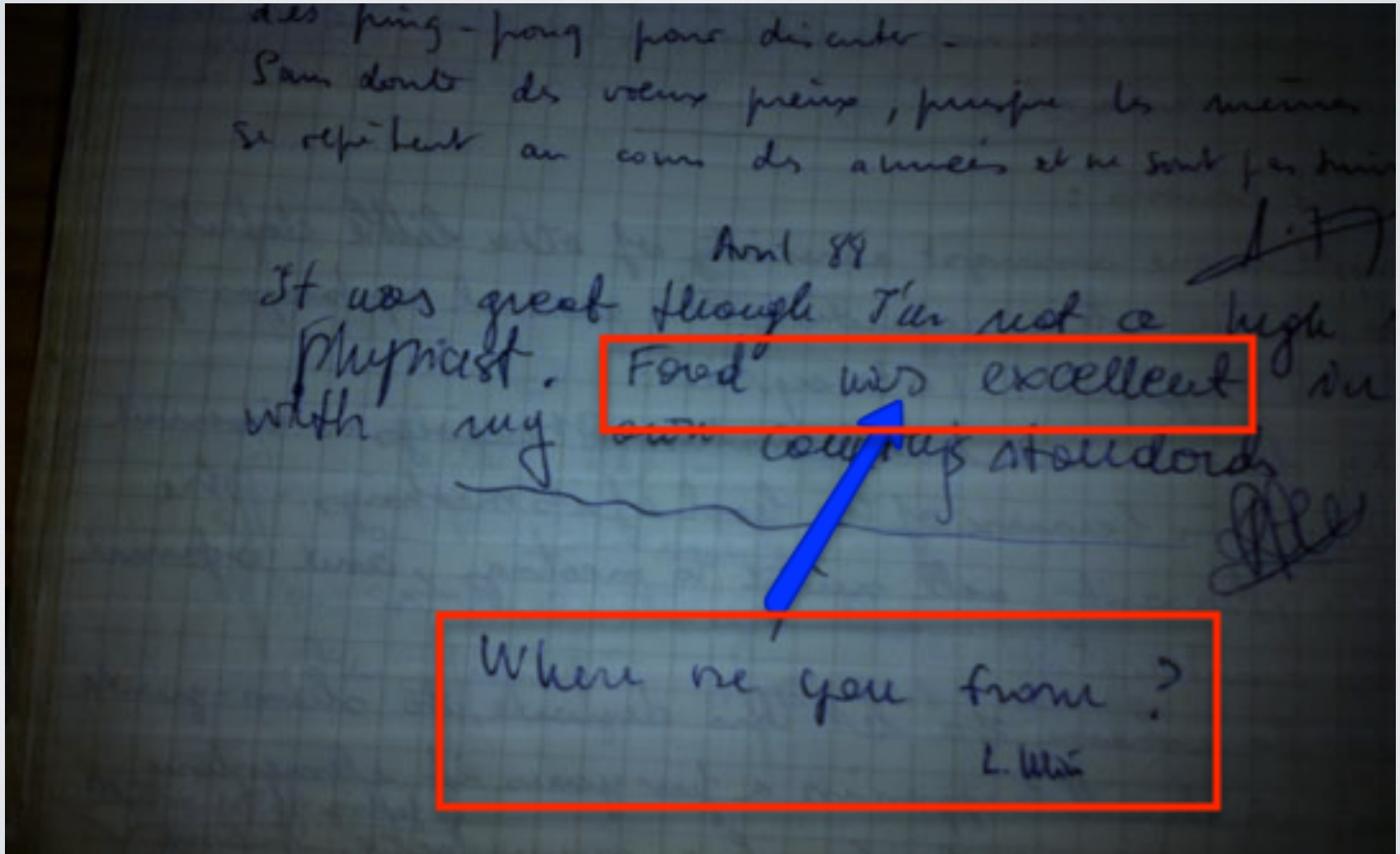
FOOD HAS IMPROVED

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	Comment		
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

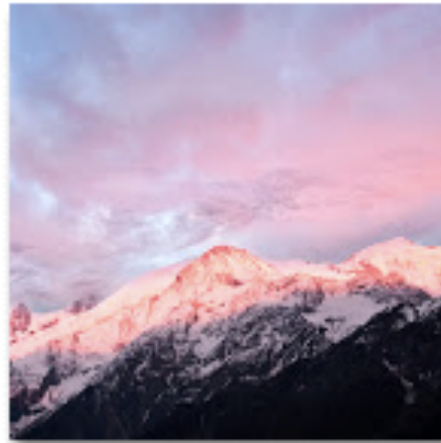
Galerie de Phys TeV Albums (3)



Jon Session 1

9 juin 2013

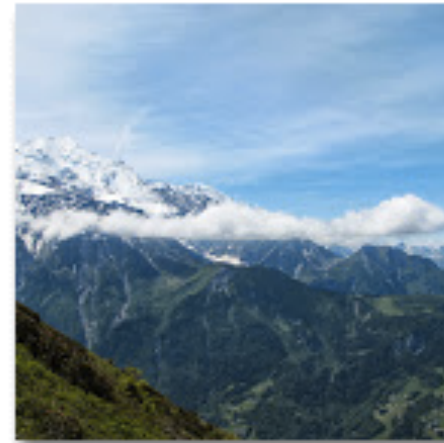
 photos : 6



AK

7 juin 2013

 photos : 4



Session 1, Fawzi

1 juin 2013

 photos : 14

Should we have a facebook account for LH?

- 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)

Because you know it's all about that Higgs,
'Bout that Higgs, no SUSY
It's all about that Higgs, 'bout that Higgs, no SUSY
It's all about that Higgs, 'bout that Higgs, no SUSY
It's all about that Higgs, 'bout that Higgs
Higgs Higgs Higgs

Yeah it's pretty clear, there ain't no BSM
But we can fake it, fake it and we can give it them
I got that boson ' that all the theorists chase
Got all the right bumps in all the right places

I see the theorists working ' on that EFT
We know that shit ain't real
So don't you give it me
If you got beauty beauty just raise 'em up
'Cause every inch of you is perfect
From the bottom to the top

Yeah, my momma she told me you gotta cut on pt
Cause otherwise you'll see things detectors just cannot see
There won't be no supersymmetric discovery
cause if that's what you're into
you'll be swamped by QCD

[instr]

My momma...

(2 x) All about that Higgs...

From Deepak on Facebook



Wednesday, June 10, 15

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

- Diego, Marco, Jean-Philippe, Philippe, Suzanne
- Secretariat in LH and at LAPTh
- Computer people at LAPTh and LAPP (Mathieu and Sylvain)
- Conveners
- All of you!