

Les Houches Workshop Series

"Physics at TeV Colliders" 2015

Session: 1-19 June



Introduction and Welcome

The Organisers



SESSION I



Laboratoire d'Anncy-le-Vieux
de Physique Théorique



Laboratoire d'Anncy-le-Vieux
de Physique des Particules



The enigma of mass



dépasser les frontières



UNIVERSITÉ
SAVOIE
MONT BLANC



Conseil Général
partenaire



MINISTÈRE
DE L'ÉDUCATION NATIONALE,
DE L'ENSEIGNEMENT SUPÉRIEUR
ET DE LA RECHERCHE

LH PHYSTEV THROUGH THE YEARS

In 1999 about 65 participants over 12 days, 1 session

2001 -> 85, 12 days

2003 → ~100 12 days

2005, 2 sessions 170 people, 3 weeks

2007, more than 300 applications! could not accommodate everyone,
two sites,

2009 about the same as in 2007! One site: The Centre


2011: more than 250 applications

2013: about the same as in 2011

2015: About 220, imbalance between session 1 and session 2

Aim and Format of the Workshop

Les Houches 2015 [Home](#) [Les Houches 2015](#)

Working Groups **Aim and Format of the Workshop** 

Wiki

Topics for Consideration

Programme in LH

Registration

Organising Committees

Poster PhysTeV 2015

Practical Info

Contact, Secretariat

LH PhysTeV Series

Freeman Dyson in LH

Previous Sessions

Search ...

Aim and Format Page 1 of 3

This **Workshop** is the ninth in a series whose aim is to **bring together theorists and experimentalists** working on the phenomenology of **TeV colliders**. The emphasis in this series of workshops has been on the physics at the LHC and the Tevatron. The highlight of the 2015 Les Houches Edition is to take full advantage of the data that has been collected at the LHC so far and prepare for the future runs. With this much data, following the discovery of a Higgs-like particle, one aim of this Workshop is how to best sharpen our tools and techniques in order to reconstruct the profile of this particle and possibly uncover New Physics. An equally important aim is to reassess some of the still open fundamental questions in the light of this discovery and investigate which kind of New Physics such a particle may be hinting at.

In view of the above considerations, the Workshop will devote particular attention to:

- (i) Higgs physics, and how it shapes our view on the mechanism of electroweak symmetry breaking;
- (ii) related searches for New Physics and
- (iii) progress in new techniques for the calculations and simulation of Standard Model processes.

The Workshop will address issues such as **how to best exploit these data** as well as how to prepare for future LHC data, and **what is most desirable in LHC upgrades**. These activities will be conducted in close connection with the development and improvements of related theory tools, in particular of Monte-Carlo event generators.

The Workshop runs over one year, including two meetings in Les Houches in the month of June, and exchanges and collaborations before and after the meetings. The meetings in Les Houches will consist of **two sessions**:

Session I: 1-10 June 2015
with emphasis on SM-related issues

Session II: 10-19 June 2015
with emphasis on New-Physics searches

Aim and Format of the Workshop

WG Topics

Coordination with other Workshops

All Pages

The meeting will consist of two sessions. The first session will concentrate mainly (but not exclusively) on Standard Model issues including Higgs physics, in particular it will cover topics related to improving precision on SM observables. The second session is geared more towards the implications of the discovered Higgs-like signal and its impact in the search of New Physics, model building, data interpretation and analyses in theories beyond the SM. As usual within the Les Houches PhysTeV series, we expect a very strong **interplay and collaboration between the different groups** and their subgroups. The latter are set up **only as a guide**. Indeed, in several instances similar activities will be covered by different working groups making a separation somewhat unnatural.

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

Topics for Consideration

(Editing this page requires special privileges: Conveners, managers)

SM and N(N)LO

NNLO: Attacking the 2013 Les Houches wish list

- what has been learned so far from NNLO calculations
- for jj , for Hj
- what common elements exist that will be useful for future calculations
- how can programs be used by non-authors?

What's left at NLO?

- Status of automated calculations
- EWRC
 - automatic inclusion of EW effects → test cases
 - Features of the TeV scale and of the transition from 8 TeV to 13 TeV
 - Photon induced processes (like $\gamma\gamma \rightarrow WW$)
 - W/Z emission
- NLO PS → NNLO PS
- exclusive jet cross sections → what does the data tell us?
- scale choices: motivation/justifications for $HT/2$

PDFs

- utility of/use of META PDFs

Fiducial cross sections

- extrapolation uncertainties to full sigma
- WW as poster child

Photons

- more on Les Houches tight isolation accord → theory with Frixione isolation = theory with NLO fragmentation with experimental fixed cone isolation (=data)

Jets & Quark/Gluon Discrimination

- physics of jet R variation
- jet sub-structure tools and how they can be part of everyday analyses (Overlaps with NLO/SM and Tools/MC a bit with Higgs (e.g. VBF tagging))
- How to define quark/gluons at fixed order? (i.e. flavored jet algorithms)
- Tests of quark/gluon taggers? (ATLAS/CMS/theory)
- Why do current parton showers give such large discrepancies in quark/gluon tagging performances?

- ◆ Topics for Consideration
 - ◆ SM and N(N)LO
 - ◆ Interface SM/BSM
 - ◆ BSM Physics/ Including non Standard Higgs

LES HOUCHES SPIRIT IN ACTION

- Avoid succession of formal, *normal* talks

LES HOUCHES SPIRIT IN ACTION



- Avoid succession of formal, *normal* talks





Lectures....in a very informal style

Tuesday, June 2, 15

CONTINUES EVEN IN THE BAR

CONTINUES EVEN IN THE BAR





A LES HOUCHES ACCORD

IN THE MAKING IN

THE BAR





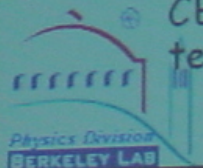
The (original) Les Houches Accords

HepUP Event Record

- Successful!
 - ⊗ Majority of MC talks at Les Houches mention it.
 - ⊗ Every ME/PS project that I've heard discussed in last 12 months uses it.
- Should extra info for ME/PS be included?
 - ⊗ No: generic information content is not yet established, everyone is trying new/different things. Still need max. freedom.
- Requests for a specified file format, -- but fear that forcing such a format would limit users.
 - ⊗ Tevatron uses FNAL MCFIO
 - ⊗ CERN MCDB using XML-like text files.

LHAPDF (structure functions)

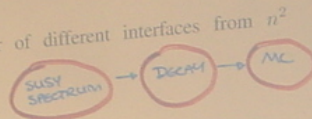
- fewer users.
- evolves PDFs ... no long lookup tables
- Includes code==maintenance
 - ⊗ To be moved to Durham, maintained by Mike Whalley
- To do:
 - ⊗ Need to allow possibility of having many PDFs in memory at one time, to facilitate use of PDFs with uncertainties.
 - ⊗ Need access to:
 - Λ_s Λ_Q $c_{\text{threshold}}$ $b_{\text{threshold}}$ Q_{min} x_{min}
 - ⊗ allow for $p \rightarrow \gamma$ (need to include evolution)
 - ⊗ and other beam particles, π , ...
 - ⊗ Other smaller changes.
 - Map author strings onto integer
 - ⊗ Try to make everything backwards compatible.
- J. Huston to coordinate.



OR/S
Les Houches 2003
B.C. Allanach

Les Houches Discord

- Les Houches 2001 accord between matrix element generators, Monte-Carlo programs
- Idea is to set same thing up between SUSY spectrum generators and other programs (co-ordinator: P Skands)
- Reduces number of different interfaces from n^2 problem to n
- long discussions
- At Les Houches 2003, then implemented one simple case (CMSSM); it **threw up** problems in the interface design
- Design principles: general structure which can be extended, conventions for particular case etc., higher loops very thorny



Homepage: <http://allanach.bcm.cern.ch/allanach/>

3

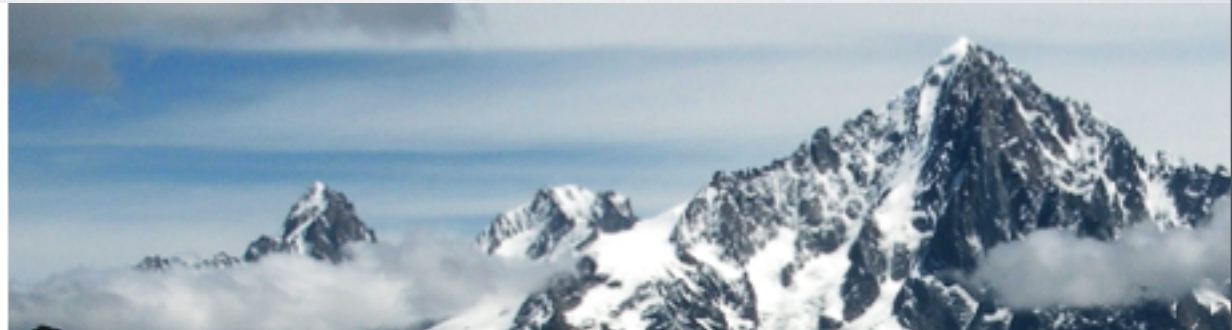
JUN 6 2003

PROGRAMME

Programme and Planning updated daily, **CONSULT the Wiki and do the Wiki, Wiki**

2015 Session

- [Home](#)
- [Topics for Consideration](#)
- [Programme in Les Houches](#)
- [Working Groups](#)
 - [Higgs](#)
 - [SM: Loops and Multilegs](#)
 - [New Physics](#)
 - [Tools and Monte-Carlos](#)
- [Conveners and Organisers \(Restricted Access\)](#)
- [Participants \(Restricted Access\)](#)
- [LH 2015 Theme](#)



Access to the wiki pages of the **2015** session.

Session 1

Monday 1 June

19h30	Dinner	LH Restauraunt
21h00	Conveners and Organisers Meet	Auditorium

Tuesday 2 June

09h00-09h15	 General Intro and Welcome	Organisers	Auditorium
09h15-12h30	Working Group Summaries		Auditorium
09h15-09h45	Higgs Theory	Massimiliano (Grazzini)	
09h45-10h15	Higgs Experimental	Kerstin (Tackmann)	
10h15-10h45	Coffee Break		Lounge in Main Building
10h45-11h45	SLM Summary	Simon (Badger), Joey (Huston), Jesse (Thaler)	
11h45-12h15	Tools and MC Experimental	Vitaliano (Ciulli)	
12h15-12h45	Tools and MC Theory	Marek (Schoenherr)	

12h45-14h30	Lunch, Coffee, Sport, ...	LH Restaurant
-------------	---------------------------	---------------

14h30-16h00	General Discussion & Task Assignment, Round Table	All	Auditorium
16h00-16h30	Coffee/Tea Break		Lounge in Main Building

19h00-19h30	Welcome Drink, ...	LH Restaurant
19h30-	Dinner, ...	LH Restaurant

Wednesday 3 June

09h00-10h30	Jettiness in NNLO Calculations	Frank Petriello	Library
-------------	--------------------------------	-----------------	---------

14h00-16h00	comparisons for the Higgs+jets study	Libray
-------------	--------------------------------------	--------

Thursday 4 June

14h30-16h00	The New PDF4LHC Accords General	SM	Auditorium
-------------	---------------------------------	----	------------

Saturday 6 June

Sunday 7 June

Weather permitting, this is a day off.

Monday 8 June

10h30-12h30	Presentation of Results and Fiducial Cross Sections (1)	All	Auditorium
-------------	---	-----	------------

14h30-16h30	ggF	Higgs	Auditorium
16h30-17h00	Coffee/Tea Break		Lounge in Main Building
17h00-18h30	Presentation of Results and Fiducial Cross Sections (2)	All	Auditorium

19h00-	Aperitif + Workshop dinner	LH Restaurant
--------	----------------------------	---------------

Tuesday 9 June

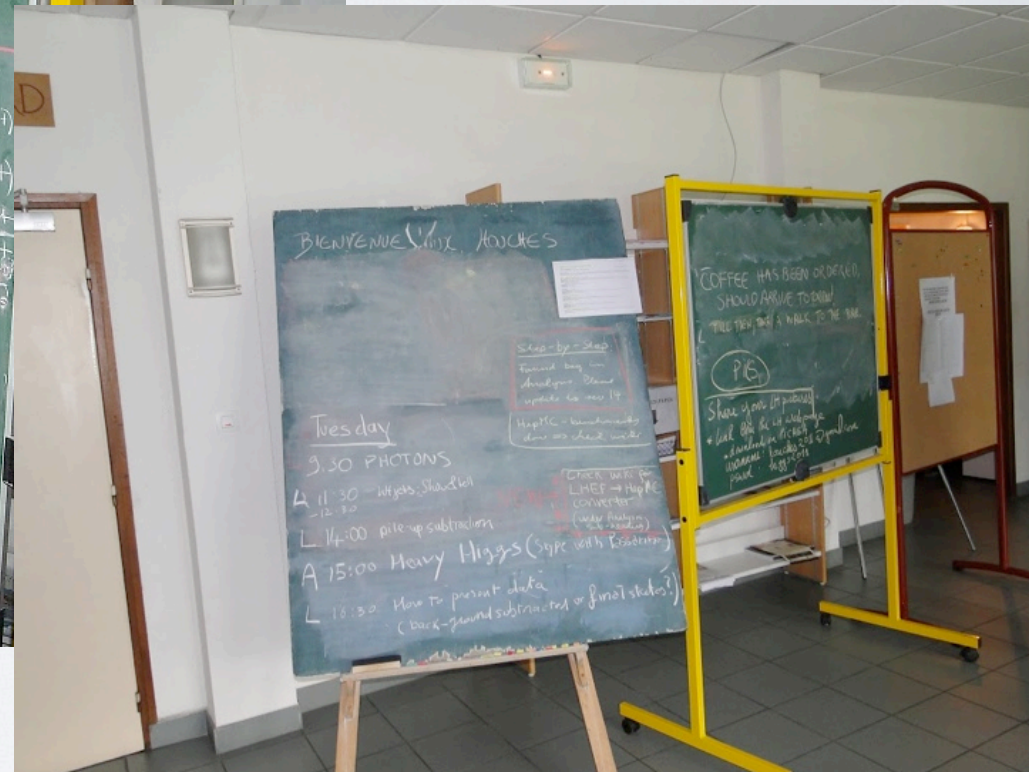
09h00-10h30	Presentation of Results and Fiducial Cross Sections (3)	All	Auditorium
10h30-	Coffee/Tea Break		Lounge in Main Building

Wednesday 10 June

09h00-12h00	Session 1 Reports of the WGs	Auditorium
-------------	------------------------------	------------

PROGRAMME

Programme and Planning updated daily, **see also the board in the entrance hall, outside the auditorium**





Les Houches

- Website
- Wiki
- Contact

2013 Session

- Home
- Programme in LH
- Participants Present in LH
 - Session 1
 - Session 2
- Working Groups Pages:
 - General List of Topics
 - Higgs
 - SM: Loops and Multilegs
 - New Physics
 - Tools and Monte-Carlos
- Conveners (Restricted Access)
- Participants (Restricted Access)

Previous Session

- 2011

Help

- How to: Latex, Tables,
- Wiki Manual

Tools and Monte Carlos

A list of topics common for sessions 1 and 2

- **Data vs Theory (Tools and MC)**
 - make use of Rivet→have Rivet tutorial early in workshop
 - dressed leptons: what is the best way of making comparisons between data and theory
 - more sophisticated looks at analyses with background subtractions
 - try to constrain jet content of UE
- **Update of LHE file format**; more information also [here](#)

A list of topics for session 1

- **Schemes to systematically evaluate uncertainties in the new NLO tools**
 - which scales to vary: standard renormalisation and factorisation scales in matrix elements
 - also in showers? if so, how?
 - starting scales of shower? how about contact to resummation calculations?
 - systematic variation of underlying event simulation: eigentunes? other ideas?
 - PDF uncertainties: how to do them properly in the shower? is this important?
- **Comparison of NLO tools (continuation/extension of HiggsWG activity)**
 - testcase: Higgs boson production in gluon fusion
 - inclusive quantities: Higgs pt, y distributions, Njets etc. & uncertainties
 - testing the high-pt regime
 - testing the two jet regime with weak boson fusion cuts
- **Inclusion of ew corrections for TeV-scale processes**
 - understanding the requirements for a systematic implementation
- **Comparison of recent NLO matching/merging tools**
 - review tools & techniques
 - highlight issues through example processes
 - aim for short write-up for non-experts on matching / merging, focusing on NLO merging, ending with roadmap for where further improvement is desired / necessary / not necessary.

A list of topics for session 2

- Proposal for a new event file format (to get rid of the huge stdhep and hepmc files)
- Extending the SLHA to include cross section information (automate event-by-event weighting with higher order cross sections)
- SMS decomposition: Libraries with simplified models, the associated analyses, LHC results as well as their implementation





Media Manager



Namespaces

Media Files

Upload

Search

Choose namespace

Files in 2015:participants

Thumbnails Rows Name Date

- [-] [root]
 - [-] 2013
 - [-] 2015
 - [-] material_files
 - [-] organisers
 - [-] working_groups
 - [-] participants
 - [-] printer
 - [-] talks
 - [-] bsm_session2
 - [-] higgs_session1
 - [-] higgs_session2
 - [-] mc_session1
 - [-] mc_session2
 - [-] rc_jets_session1
 - [-] talks_organisers
 - [-] wiki



entrance_...

2015/05/21
17:31
7 KB

MEETING AND DISCUSSION ROOMS: ALL WITH BLACKBOARD, VIDEO PROJECTORS

- Auditorium =70 people
- QCD Room~15 (20 max)
- Library~25-30



Reservation of video projectors, (slide projectors): See local organisers

JPG, FB, Philippe G., Diego G., **Suzanne G.**,

Seminar Room allocation: Reserve on the boards outside the auditorium, or on the wiki

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

NETWORK & COMPUTING

- what we used to say
- don't expect your usual internet connection speed when 40 people are on skype and others on youtube,

share ??????



Networks

1. EDUROAM

2. WIFI ACCESS

look at the folder in your pigeon hole, credentials to use this network are given. 2 accounts per user.



- **Restaurant:**

- Lunch: 12.30 (exception today 12.45) **sharp**, coffee (free) after lunch at the bar (below the restaurant)
- Dinner: 19.30. Try and Enjoy the local wines to make new friends. A **jar of wine per table is part of the deal**. More you **pay**.

- **Bar** open after dinner. Count how much you drink, alcohol, beer included, **not free**
- **Coffee and tea breaks:** please wash your cups. **Soda not free**, write your name on the list, settle bill before departure. (Espresso free)
- **Lunch boxes:** order the night before. If you plan to skip lunch let us know

- Today | 9.00 Welcome Drink
 - The Centre Restaurant/Cafeteria
- Monday June 8th Workshop Dinner

OUTDOOR ACTIVITY

Don't get lost



OUTDOOR ACTIVITY



Mountain Bikes

There are 5 mountain bikes, first come, first served. The keys are on a board by the Secretariat. Write your name and indicate the bike number and the time you are reserving for.

The bikes are kept in the shed (building 951) by the restaurant, see intranet=wiki participants

- Climbing, hiking, walks, maps: Jean-Philippe G
 - weather permitting, Sunday is a “rest” day.

Cycling

- Please inform at least one of the organisers, let them know where you are going, fill **the book in the hall**, give approximate time of when you'll be back

- It's a good idea to write

down your mobile phone number



Follow the guide



SECRETARIAT IN THE CENTRE

- Secretariat: fees, accommodation issues

Open from 8.45-12.30 & 13.30-17.30 (closed week end)

- Please pay your fees (non FP support)
- FP (those working in the French system): please leave the *attestation* in my pigeon hole
- All non FP will have to contact the Les Houches secretariat and pay the fees directly to them starting from 2pm today
- Ticket (pass) for the Chamonix Valley (buses and train): ask Secretariat

EMERGENCY NUMBERS

- Fawzi : +33 6 87 82 87 83
- Diego: +33 6 45 45 59 75
- Philippe + 33 6 77 78 05 98
- Suzanne G. +33 6 63 55 90 60

- In case of emergency contact the caretaker, Jean Francois Aubrun, Alpens, Apt 3, +33 6 78 98 52 40. On WE replaced by agents form a security firm, same tel. number

Important Information for the 2015 Participants

Some information for those attending the Workshop in Les Houches will be posted here.

- **Bulletins** with important information (in case you emptied your mailbox!)
 - *6 May 2015 Network and Wifi Connection*: Please Read and Set Up BEFORE you come to Les Houches: [go here](#)
 - *24 April 2015 Use of Wiki, Conference Bus*: [go here](#)
- **Book your seat on the Workshop Bus** (CERN \longleftrightarrow Les Houches): [go here](#)
- **Pin Codes to enter the buildings/chalets in Les Houches and access your rooms** [go here](#)
- **Mountain Bikes** [cycle here](#)

Mailing Lists

- **Mailing lists** per working group (send a message to the whole working group) [access here](#)
- **The list of participants** per group and per session (from there you can send an email to a participant not the whole working group) [it's here](#)

Network, Computers and Printing

- **Network & Wifi** [see here](#)
- **Printing** Follow the step by step procedure to print for MacOSX, Linux and Windows [here](#)

HAVE A NICE WORKSHOP!!