



Les Houches Workshop Series "Physics at TeV Colliders" 2013 Session: 3-21 June

LES HOUCHES



Ce n'est qu'un au revoir **The Organisers**

AULD LANG SYNE
WE'LL MEET AGAIN



SESSION I



LES HOUCHES SPIRIT ?



LH SPIRIT

$$\left[\begin{array}{l} \frac{d}{d\tilde{r}^2} \left(A(\alpha_s \tilde{r}^2) \log \tilde{r}^2 + B(\alpha_s \tilde{r}^2) \right) \\ \approx s(M) \approx s(M_e) \left[\log \frac{M_e}{\mu} \right] \end{array} \right] \rightarrow$$
$$\left(z_1, M_e \right) \left(\frac{x_1}{z_1}, M_e = \frac{1}{b_1} \right) \left(\frac{dz_2}{z_2} \right) \left(z_2, M_e = \frac{1}{b_1} \right)$$



1 $t\bar{t}$ QCD NNLO inclusive ✓
 2 dijet QCD NNLO gg ✓
 *3 $H+jet$ QCD NNLO gg ✓
 ? m_t ?
 *4 $V+jet$ QCD NNLO
 *5 VV QCD NNLO
 { onshell/offshell
 Conka/Mitor onshell
 *6 $\gamma\gamma$ QCD NNLO fully exclusive ✓

$\{t\bar{t}+1jet\}$
 $2jet$ NLO
 R_{jet}/jet
 $Z\gamma$
 $W\gamma$
 ~~W^+W^+~~
 ~~W^+W^-~~
 ~~W^-W^-~~
 ~~W^+Z~~
 ~~W^-Z~~
 offshell NLO
 needed for
 searches
 of multi
 photon

- 7) single top | b mass (M)
- 8) $W+c$ (fragmentation) (S)
- 9) $\gamma+jet$ (L?) (S)
- 10) $H+W$ fully differential jet veto (S)
- 11) $H+W$ almost done (S)
- 12) 3jet (S)

~~NLO with BlackHat+Sherpa~~

NLO cross section

$$\sigma_n^{NLO} = \int_n \overset{\text{Born}}{\sigma_n^{\text{tree}}} + \int_n \overset{\text{loop: lc and fmlc}}{(\sigma_n^{\text{virt}} + \sum_n^{\text{vsub}} \sigma_n^{\text{sub}})} + \int_{n+1} \overset{\text{real}}{(\sigma_{n+1}^{\text{real}} - \sigma_{n+1}^{\text{sub}})}$$



BlackHat

so this is not Sherpa the parton shower, but Sherpa used as a (very efficient) fixed order matrix element



AMBLEWEB SUBTRACTION MACHINE

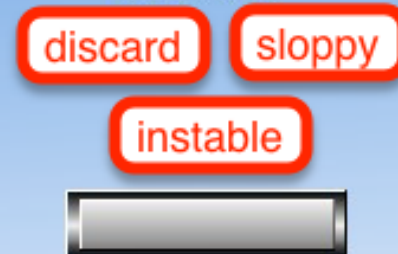
Copyright (C) Ambleside C.E. Primary School, 1999

$$\quad - \quad = \quad \square$$

New numbers

Check my answer

Score



EXIT

INSTRUCTIONS:
Choose a skill level
Type the answer
Click the button to check it

RESET SCORE

Correct Incorrect



Les Houches

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- Contact

2013 Session

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 - General List of Topics
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 - 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

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- Tools and Monte Carlos
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HEPDATA wishlist

HEPDATA is seen as crucial for long-term data curation, and for ease of access, for example for Rivet.

Several desirable extensions were discussed, some of which are essential.

Data types

There is a need to end the assumption that all data are in the form of histograms (with x/y axes).

Non-histogram data which needs to be stored include:

- cross sections w/o artificial bin, co
- correlation/error matrices
- +/- excursions for multiple systematics (this should be output for rivet, and is the preferred format for storing/expressing correlations)
- link to Rivet analysis
- link to paper and other documentation (arXiv/inspire)

Search facility

Needs upgrading, better keywords, more user-friendly.

Data entry

Formats should be specified, and auto-entry enabled with the possibility of test uploads and authorisation by experimental contacts.

Export to & import by Rivet

- plot titles and captions
- data year, experiment, luminosity

Rivet to add these to plots. Rivet should also be able to get the MC name and versions from [HepMC](#) and add

NNLO QCD and NLO EW Les Houches Wishlist

Wishlist part 1 - Higgs (V=W,Z)

Process	known	desired	motivation
H	$d\sigma @ \text{NNLO QCD}$ $d\sigma @ \text{NLO EW}$ finite quark mass effects @ NLO	$d\sigma @ \text{NNNLO QCD} + \text{NLO EW}$ MC@NNLO finite quark mass effects @ NNLO	H branching ratios and couplings
H+j	$d\sigma @ \text{NNLO QCD (g only)}$ $d\sigma @ \text{NLO EW}$	$d\sigma @ \text{NNLO QCD} + \text{NLO EW}$ finite quark mass effects @ NLO	H p_T
H+2j	$\sigma_{\text{tot}}(\text{VBF}) @ \text{NNLO(DIS) QCD}$ $d\sigma(\text{gg}) @ \text{NLO QCD}$ $d\sigma(\text{VBF}) @ \text{NLO EW}$	$d\sigma @ \text{NNLO QCD} + \text{NLO EW}$	H couplings
H+V	$d\sigma(\text{V decays}) @ \text{NNLO QCD}$ $d\sigma @ \text{NLO EW}$	with $H \rightarrow b\bar{b}$ @ same accuracy	H couplings
$t\bar{t}H$	$d\sigma(\text{stable tops}) @ \text{NLO QCD}$	$d\sigma(\text{NWA top decays}) @ \text{NLO QCD} + \text{NLO EW}$	top Yukawa coupling
HH	$d\sigma @ \text{LO QCD}$	$d\sigma @ \text{NLO QCD}$	Higgs self coupling

Wishlist part 2 - jets and heavy quarks

Process	known	desired	motivation
$t\bar{t}$	$\sigma_{\text{tot}} @ \text{NNLO QCD}$ $d\sigma(\text{top decays}) @$	$d\sigma(\text{top decays}) @ \text{NNLO QCD} + \text{NLO EW}$	precision top/QCD, gluon PDF

Workshop is not over yet just started...

Session 1: 3-12 June 2013

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.

Higgs: SM Issues

Theory

D. De Florian, Univ. Buenos Aires, Argentina

Electroweak Contact: S. Dittmaier, Freiburg Univ., Germany

Experiment

M. Kado (ATLAS), Orsay, France

A. Korytov (CMS), Univ. Florida, Gainesville, USA

SM: Loops and Multilegs

Theory

N. Glover, IPPP Durham, UK

Electroweak Contact: S. Dittmaier, Freiburg Univ., Germany

Experiment

J. Huston (ATLAS), Michigan State Univ., USA **Snowmass Contact**

G. Dissertori (CMS), ETH Zurich, Switzerland **Liaison Session 1<->Session 2**

Tools and Monte-Carlos

Theory

F. Krauss, IPPP Durham, UK

MC-NLO Contact: K. Hamilton, CERN, Switzerland and Univ. Coll. London, UK

Jets Contact: G. Soyez, SPHT-CEA Saclay, France

Experiment

J. Butterworth (ATLAS), Univ. Coll. London, UK



WIKI, WIKI

Trace: • participants • start • sm • tools

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 - 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 the LHE file format** The LHE file format has been around since 2006 and at the workshop 2009 there was a proposal for an updated version 2 of the format. Before this meeting additional suggestens were mad, mainly related to the handling of weights [here](#) and [here](#). After discussion there is now the following [suggested LHEF update](#).
- [Proposed updates of HepMC event record](#)
- [HEPDATA wishlist](#)

Edit

A list of topics for session 1

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 - [NLO matching schemes and uncertainties](#)
- 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

2013:groups:tools:start

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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

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



start
djema

start.txt · Last modified: 2012/11/01 22:43 by boudjema

- [Session 1](#)
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through the media manager in the

Session 1

Monday 3 June

19h30	Dinner
21h00	Conveners and Organisers

Tuesday 4 June



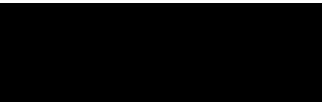
09h00-09h15	 General Intro
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Houches 2013: Participants


⚠ Access Reserved

Edit

Session 1 & 2 Participants

- **Mailing Lists** (send mail the conveners, participants to session 1, session2,..)
- User's Guide to Computing and Network in Les Houches,  [download](#)
- Share your pictures.  [Picasa](#), [upload](#). Use the following
 - - username: leshouches13
 - - pswd: 

Session 1 Participants

- Saturday June 8th is our day off, **Important information** concerning hiking, etc....
- Please fill the on-line questionnaire  [here](#)

Session 2 Participants

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- ◊ [Session 1 & 2](#)
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PROCEEDINGS

- Deadline **31 December 2013**
- 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.
- 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!)**

SVN

FOOD HAS IMPROVED

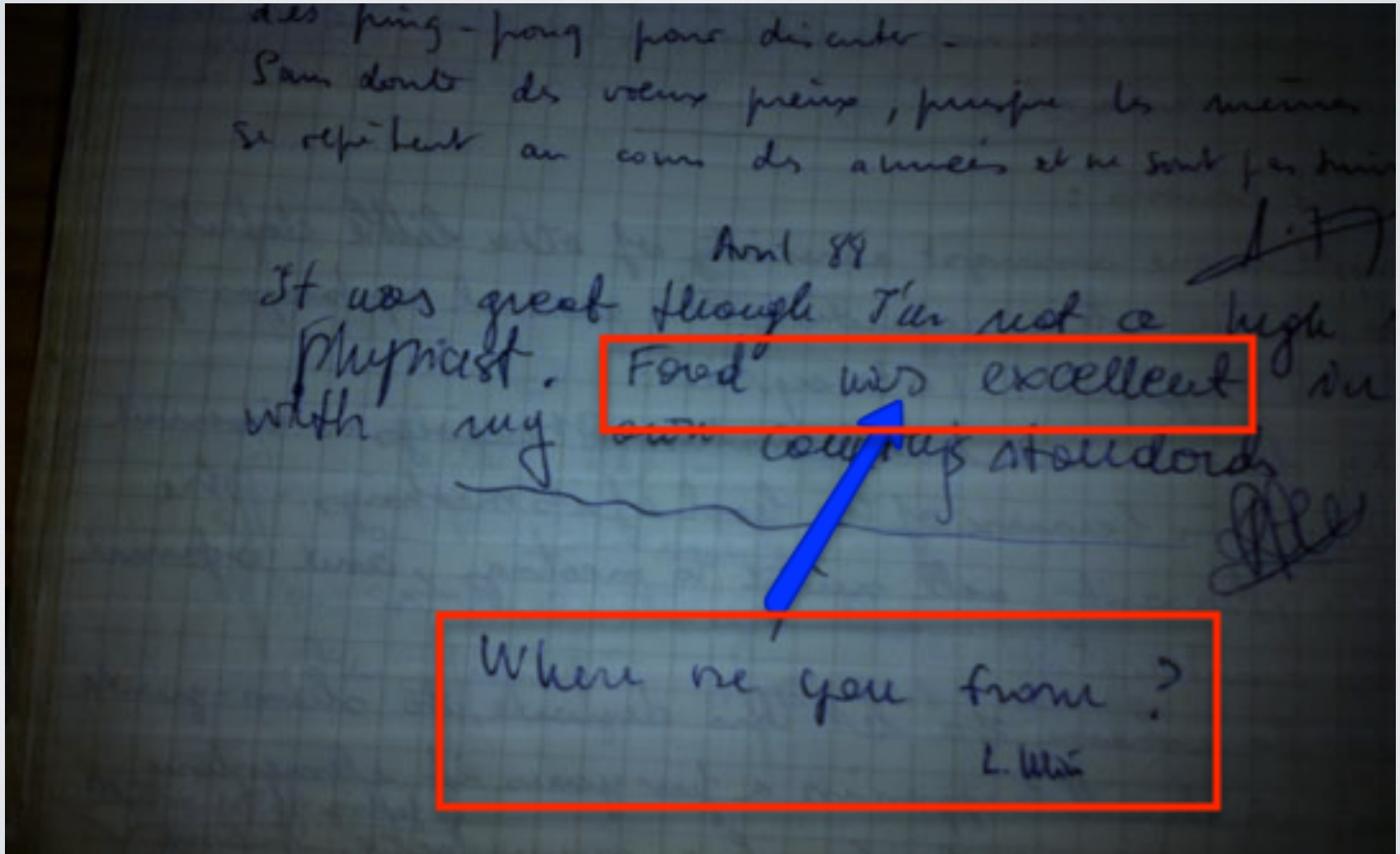
ASK THOSE WHO HAVE BEEN COMING HERE FOR YEARS



16

FOOD HAS IMPROVED!

ASK THOSE WHO HAVE BEEN COMING HERE FOR YEARS



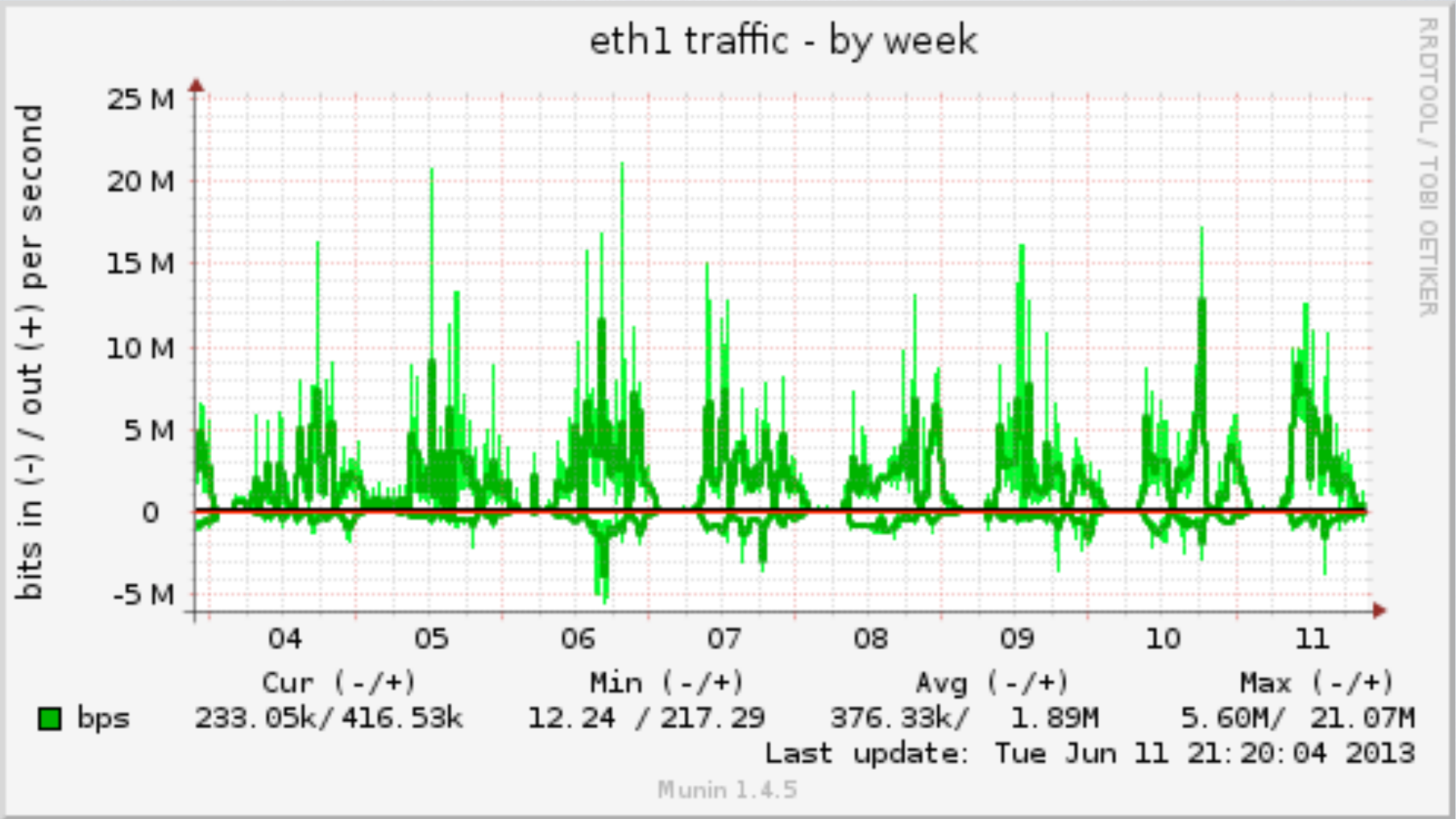
NETWORK

Host State Breakdowns:



State	Type / Reason	Time	% Total Time	% Known Time
UP	Unscheduled	7d 19h 47m 37s	98.959%	98.959%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	7d 19h 47m 37s	98.959%	98.959%
DOWN	Unscheduled	0d 1h 58m 30s	1.041%	1.041%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 1h 58m 30s	1.041%	1.041%
UNREACHABLE	Unscheduled	0d 0h 0m 0s	0.000%	0.000%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 0h 0m 0s	0.000%	0.000%
Undetermined	Nagios Not Running	0d 0h 0m 0s	0.000%	
	Insufficient Data	0d 0h 0m 0s	0.000%	
	Total	0d 0h 0m 0s	0.000%	
All	Total	7d 21h 46m 7s	100.000%	100.000%

NETWORK



NETWORK & COMPUTING

- Had to set up a new network with servers from LAPP-LAPTh, but we still have to rely on the local infrastructure
- share**
- don't expect your usual internet connection speed when 40 people are on skype and others on youtube,



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

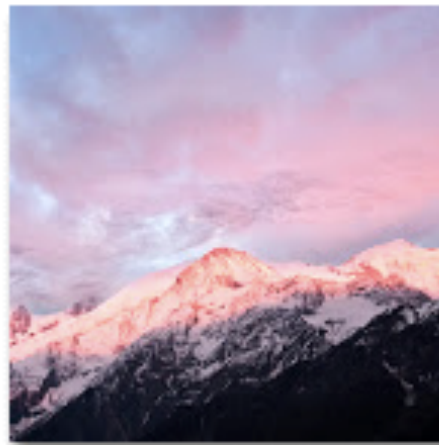
Galerie de Phys TeV Albums (3)



Jon Session 1

9 juin 2013

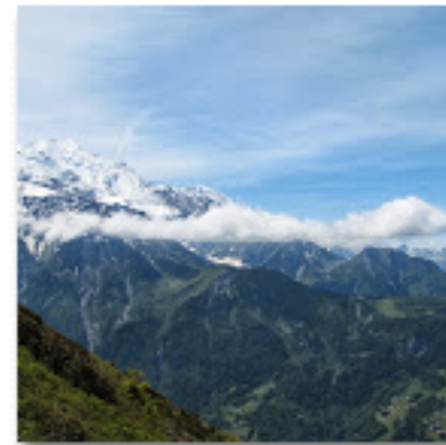
 photos : 6



AK

7 juin 2013

 photos : 4



Session 1, Fawzi

1 juin 2013

 photos : 14

Suggestions on how to improve, how to allow more people, not to allow more people,

Summary 2009: Let's hope we will have data at the next LH..

Summary 2011: At the next LH, a signal ?

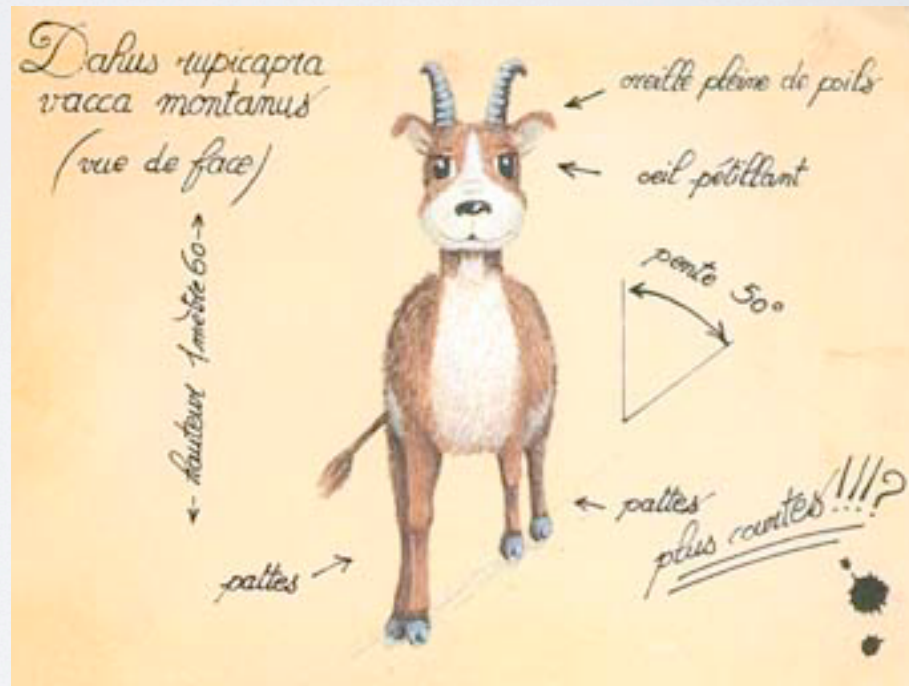
For 2015?

THANKS

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

HAVE A NICE JOURNEY

- Beware of the DAHU !



Dummst AnzumeHmender User
(from Stefan D.)