The LHC / LC Study Group

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IPPP Durham

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Web page: `www.ippp.dur.ac.uk/~georg/lhclc`

LHC / LC Study Group

The aim of the LHC / LC Study Group is to investigate how analyses at the LHC could profit from results obtained at a LC and vice versa. It is furthermore studied how informations obtained at both machines can most effectively be put together in order to explore the mechanism of electroweak symmetry breaking, the underlying structure of SUSY theories, etc.

Aim: investigate how analyses at the LHC could profit from results obtained at a LC and vice versa

- New initiative, working group is just forming

  Currently about 80 working group members from ATLAS, CMS, LC working groups, theory

- Working group coordination:

  `Georg.Weiglein@durham.ac.uk`

  U.S. co-coordinator to be appointed

- Web page:

  `www.ippp.dur.ac.uk/∼georg/lhclc`

- First meeting:

  St. Malo, April 12–15

- **Next meeting: CERN, July 5**

- Long term goal ($\sim$ 1 year):

  Working group report

Work is just starting, help needed!

Parallel session:

Saturday, 16:30–19:00: $>$ 40 participants

A. de Roeck	ATLAS and CMS activities
K. Jakobs	Higgs parameter determination at the LHC
F. Richard	Some inputs on LC / LHC complementarity
W. Porod	Reconstruction of the fundamental theory from LHC and LC data
K. Desch	MSSM consistency tests via Higgs sector observables
E. Boos	Top polarization at hadron and $e\gamma$ colliders
All	Discussion, plans for further study group activities

Study topics collected so far, SUSY:

- Constraints on mSUGRA parameters (later also GMSB, AMSB scenario) from combining LHC and LC data
  A. Parker (Cambridge group), G. Polesello

- Reconstruction of the fundamental theory from LHC and LC data
  G. Blair, W. Porod, P. Zerwas, CMS

- LHC / LC complementarity in determination of low-energy SUSY parameters

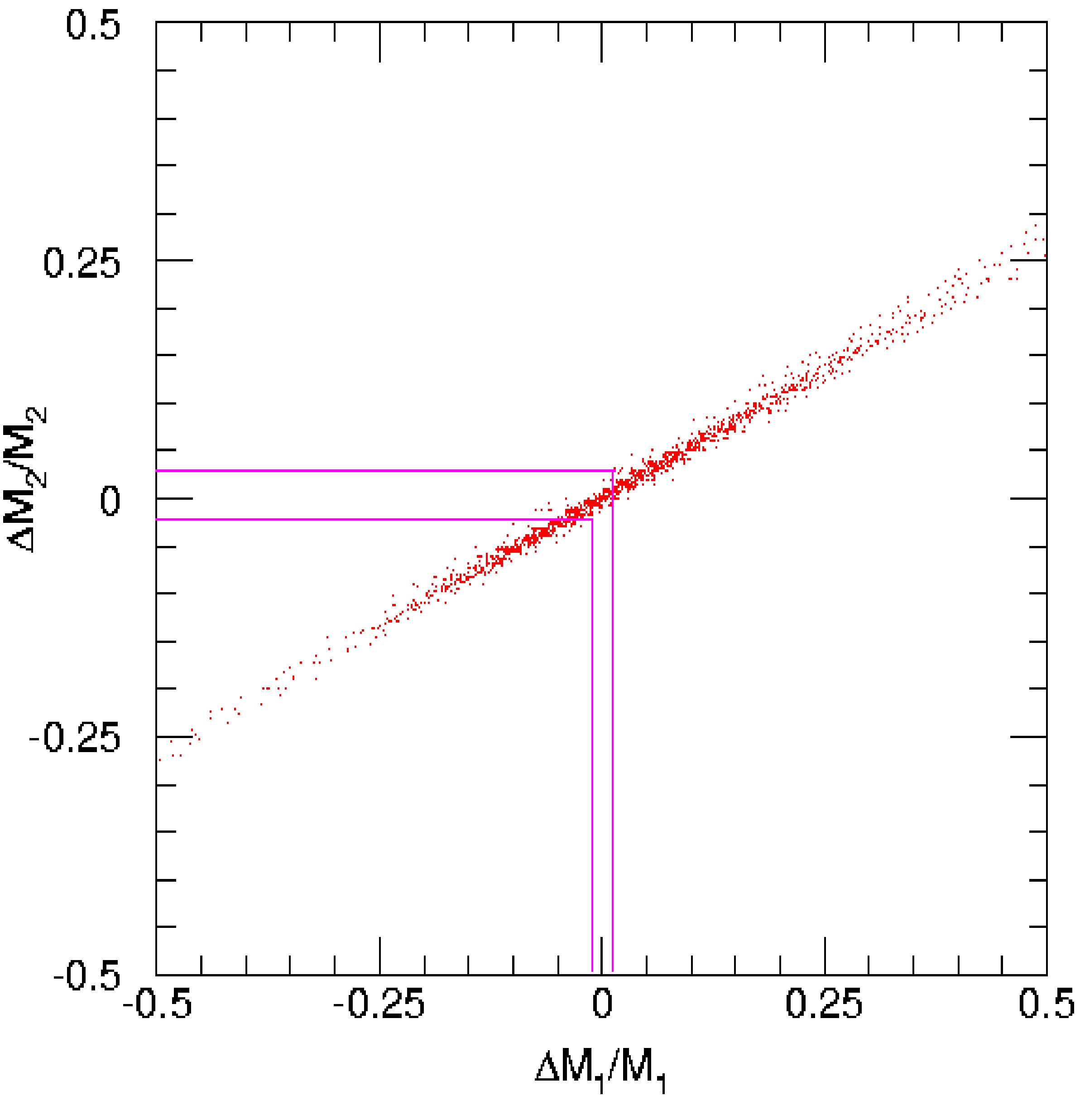
  E.g.: $\tan\beta$ determination
  M. Beccaria, C. Lester, F. Renard,
  P. Richardson, C. Verzegnassi

- Improvement of LHC analyses (e.g. of cascade decays) by including input on masses and BR's from LC?
  A. Parker (Cambridge group), D. Tovey

E.g.: Impact of precise measurement of LSP mass on LHC analyses

Determination of $m_{\tilde{\chi}_2}$:

[*ATLAS TDR*]



$\Rightarrow$ LC accuracy on $m_{\tilde{\chi}_1}$ yields drastic improvements

SUSY study topics, cont'd:

- Channels / analyses that only become possible using input from both machines

  E.g.: input on colorless gauginos from LC data
  $\Rightarrow$ determination of couplings of squarks to colorless gauginos at the LHC?
  A. Parker (Cambridge group), D. Tovey

- Consistency tests of MSSM in neutralino/chargino sector by combining LC information on light states with LHC information on heavier states?
  B. Gaißmaier, J. Kalinowski, G. Moortgat–Pick, G. Polesello

- Slepton production at the LHC and the LC
  M. Berggren, E. Boos, A. Djouadi, A. Freitas, B. Gaißmaier, G. Moortgat–Pick

- Stop and Sbottom decays into Higgs singlets
  S. Kraml, W. Porod

- Does precise measurement of m_{t} and α_{s} at the LC help in LHC analyses?
  S. Heinemeyer, G.W., M. Winter

Study topics, Higgs:

- SUSY Higgs physics: what can be gained from combining LHC information on heavy Higgs states with LC information on properties of the light Higgs?
  K. Desch, E. Gross, S. Heinemeyer, F. Moortgat, G.W.

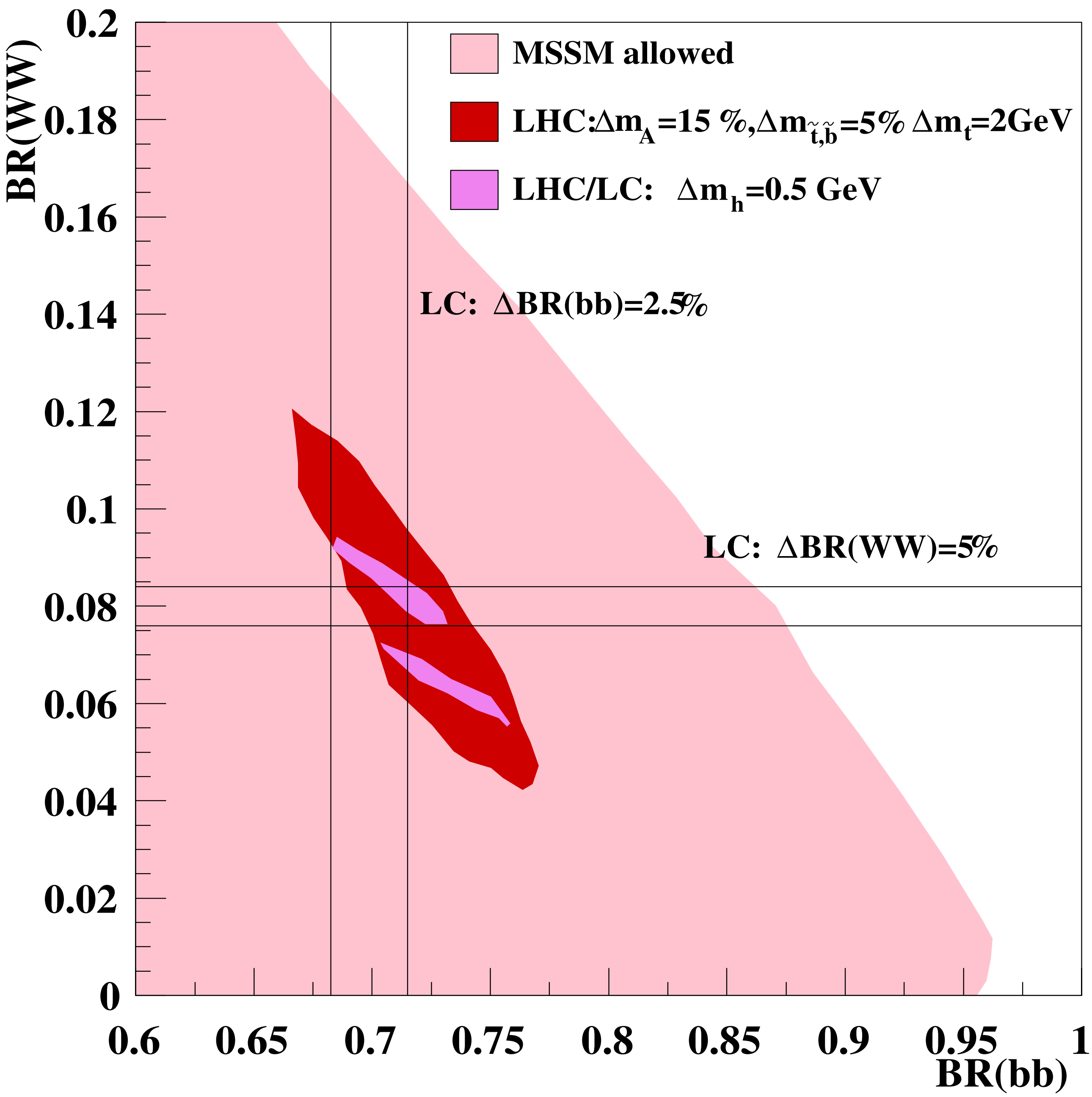
- SUSY Higgs physics, scenario where the LHC sees part of the SUSY spectrum and only a light Higgs: using LHC and LC results for determining SUSY parameters
  D. Asner, K. Desch, E. Gross, S. Heinemeyer, G.W.

- Decays of heavy Higgses into light Higgses at the LHC:
  how can one make use of LC input?
  E. Duchovni, U. Ellwanger, L. Fanó, J. Gunion, C. Hugonie, D. Miller, S. Moretti

- Can LC data on $\Gamma(H \to gg)$ be useful for prediction of $\sigma(gg \to H)$ at LHC?
  K. Desch, R. Harlander

E.g.: E.g.: Prediction of BRs of the light Higgs from measurements of heavy Higgs properties at the LHC vs. experimental precision at the LC

[*K. Desch, S. Heinemeyer, G.W. '02*]



$\Rightarrow$ very sensitive test of the model

Higgs study topics, cont'd:

- Scenario with a relatively heavy SM-like Higgs ($M_{\mathrm{H}} \approx 400$ GeV): disentangling new physics using LHC and LC results
  F. Richard

- How to exploit LC precision on m_{t} and α_{s} for (SUSY) Higgs physics at the LHC?
  S. Heinemeyer, G.W., M. Winter

Electroweak physics:

- Rare top-quark decays, top couplings
  S. Slabospitski

- Determination of triple gauge-boson couplings, quartic couplings, electroweak precision measurements
  U. Baur, A. Denner, S. Dittmaier, K. Mönig, M. Roth, D. Wackeroth

- Top polarization
  E. Boos, S. Weinzierl

QCD

- Study of BFKL phenomena at LHC and LC with different systematics

Alternative theories:

- Measurement of Z' mass at LHC
  $\Rightarrow$ determination of Z' couplings at LC

  Z': extended gauge group or KK excitation?
  G. Azuelos, P. Bambade, F. Richard, S. Riemann

- Using LHC results on resonances in strongly interacting gauge-boson sector as input for LC analyses
  T. Barklow, W. Kilian, ATLAS

- Radion physics
  M. Battaglia, E. Boos, J.A. Hewett, T. Rizzo

Summary

- First meeting of new LHC / LC Study Group at St. Malo

  respose and participation very encouraging

  many new ideas and new "recruitments"

- U.S. Co-coordinator to be appointed

- Plan to write working group report at time scale of ≈ 1 year

- Some studies already on the way, some subgroups are just forming

  Help needed!

  Web page and mailing list will be continosly up-dated

- **Next meeting: CERN, July 5**