# News from the Analysis Project Board

**Markus Schumacher (ALU Freiburg)**

**on behalf of the Analysis Project Board and the Analysis Centre**

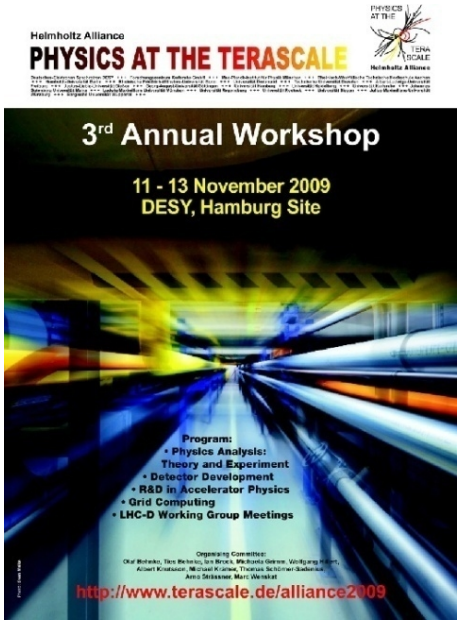
PHYSICS AT THE TERA SCALE

**Helmholtz Alliance**

- Mission and structure of analysis activities in the alliance
- Overview of Work Packages and their Status

Changes and News

My own critical comments



# Physics analysis: one of the 4 alliance pillars

**Physics at the Terascale**

**Physics Analysis** | **Grid Computing** | **Detector Science** | **Accelerator Science**

Scientific Goals

**Data Analysis**
- Understanding LHC Detectors
- Physics at the LHC
- The path to the ILC

**Analysis Tools**
- Algorithms and Techniques
- Simulation Tools

**Theory/Phenomenology**
- Monte Carlo Generators
- Precise Predictions
- New Models

Work Packages

**Analysis Network**
- Alliance Working Groups
- Monte Carlo Group
- Virtual Theory Institute

**Analysis Centre at DESY**

**Training and Exchange**

## Mandate and Mission

- support groups in Germany exploring TeV scale
- increase cooperation btw. institutes and theory + experiment
  → increase efficiency of LHC analysis + ILC physics studies
  →create addon value (alliance of 21 > 21 seperate institutes)

- 3 work packages: - Analysis Network
  - Analysis Centre at DESY
  - Training and Exchange

- Greatly supported by backbone activities:
  Young Investigator Grups (YIGS) , tenure track positions, fellows, dual career opportunities, interims professorships,…

**Backbone Activities**

Management – Young Investigator Groups - Fellowships – Equal Opportunities – Outreach – Interim Professorships

# „Backbone“ support for analysis activities (not complete)

- 4 out of 5 Young Investigator Groups (YIGs) filled, 1 open in GO

  Peter Uwer, HU Berlin — Arno Straessner , Dresden

  Stefan Gieseke, Karlsruhe — Wolfgang Wagner, Wuppertal

- Fellows ( 4 years appointment, financed 2 or 4 years by alliance)

  9 in theory: Anna Kulesza (AC), Ben O‘Leary (AC/BN), Karina Williams(BN), Jong Soo Kim (DO), Oliver Brein (FR), Oleg Veretin (HH), Mikhail Rogal (KA), Stefan Berge (MA), Barabara Jäger (WÜ)

  8 in experiment: Tatsiana Klimkovich (AC), Ekaterina Kuznetsova (DESY), Zuzanna Rurikova (FR), Markus Warsinsky (SI→FR), Gordon Kaussen (HH), Fedor Ratnikov (KA), Frank Ellinghaus (MA), Xuai Zhuang (MU)

- Permanent or Tenure track

  Thomas Schörner-Sadenius and Zoltan Nagy (DESY Analysis Centre)

  Malgorzata Worek (WU) — Tobias Huber (SI)

# Work Packages (WPs)

- WP1: Analysis Network
  - Alliance working groups = formerly called LHC-D working groups
  - Analysis working groups
  - Virtual Theory Institute (VTI)
  - Monte Carlo network

- WP2: Analysis Centre (AC) at DESY
  - Analysis Centre Groups: MC, PDF, Statistics
  - Discussion weeks, Documentation and User Support
  - Knowledge database
  - AC seminars, discussion weeks, scholarships, topical workshops

- WP3: Training and Exchange

- Additional support for activities due to new call for proposals

# WP1 Analysis Network: Working Groups

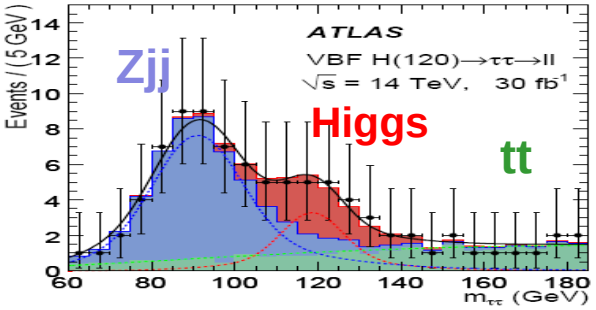
- Alliance working groups = former LHC-D groups hosted by KET
  regular workshops (→separate summaries during this meeting)

- Analysis working groups

  goal: collaboration on specific analysis issues  support: travel expenses

  - Central Jet Veto
  - Higgs production in association with heavy quarks
  - BSM Parameter Determination at LHC
  - M(tau tau)
  - R-Parity Violating SUSY at the LHC
  - Neutrino Masses and Lepton Flavor Violation at LHC (this afternoon)

  M(tau tau): prime example
  - contribution from theory, ATLAS, CMS
  - regular workshops (next this afternoon)
  - excellent wiki page




  others groups need to be revived, more active and better organised

- topical workshops hopefully seeding a new group:
  Single Top Production + 4th Generation at LHC,
  Visual Physics Analysis VISPA tool,  Fittino, …

# WP1 Analysis Network: Virtual Theory Institute

- foster collaboration between different institutions

  support: travel expenses for mutual visits
  so far: - HH and MA „radiative corrections“,
  - BN and MPI „RPV SUSY“ (for now completed, 2 papers and PhD thesis)
  - BN, HH and FR „HiggsBounds“

- support of topical workshop on automated NLO calculations in WU

- VTI seminars: allows participation in „local“ seminars via EVO
  good start in 2008, revival after one year of break

2008 20. 5. S. Grab, "Sneutrino or Stau as the LSP in mSUGRA with R-Parity Violation and Signals at Hadron Colliders"
24. 6. H. Haber, "The wrong-Higgs Couplings of the MSSM"
4.11. C. Quigg, "Worlds without Higgs"

2009/10 scheduled 2.11. S. Heinemeyer , "SUSY predictions for the LHC"
7.12. B. Webber , "tba“
11. 1. M. Mangano , "tba„

- VTI will not be maintained as a seperate instrument but fully integrated in APB
  → cleaner and more efficient management
  → stronger interaction btw. theory and experiment

# WP1 Analysis Network: Monte Carlo Network

- Who?
  - Analysis Centre MC group
  - YIG group in KA (S. Gieseke)
  - tenure track in WU (M. Worek)
  - permanent in SI (T. Huber)
  - fellow in FR (M. Warsinsky)
  - two new postdocs in HH (1 year from alliance)
  - several German groups working on MC generators (incl. DESY analysis centre)

- significant contributions to several MC event generators:
  Herwig++, HELAC, Sherpa, Whizard, CASCADE
- goal: provide generators also usable for data analysis once the LHC luminosity allows precision analyses → use/implement higher order corrections
- common effort for implementing NLO loop corrections to automatic ME generators and matching ME calculations with parton showers
  - coordination meeting in November 08 in BN
  - topological workshop in 09 in WU
  - next meeting on 4.12. in KA
- collaboration between partner of could be tighter

# WP2: Analysis Centre (AC) at DESY

- Mandate:
  enhance the physics potential of the German LHC/ILC community by providing analysis infrastructure a. by supporting analysis-related issues of general relevance.

- the AC are : 13 “core people” mostly from DESY (head T. Schörner-Sadenius)
  3 AC WGs, additional people from DESY and alliance partners
  everybody doing analysis in D is by definition part of the Analysis Centre!

  all partners are invited to contribute (and profit) → maximise the added value

- Mission:
  - Education and training (schools, workshops, documentation, …) (WP3)
  - Basic research, tools development and user support in central fields
    - Monte Carlo generators (MC),
    - Parton Distribution Functions (PDFs)
    - Statistics Tools
  - General support of LHC/ILC analysis (to be developed)
  - Networking: bring together community, provide meeting place and knowledge database

  to fulfill above mission requires more personpower in AC and at partner institutes

# AC Monte Carlo Group

- core contributors: H. Jung, J. Katzy, A. Knutsson, S. Levonian, Z. Nagy
- additional contributions from outside DESY → MC network
- regular roughly biweekly meetings

- Mission:
  - systematic understanding of (QCD) LHC events, including parton shower, PDF, hard scattering and their interplay.
  - tuning of Monte Carlo generators in and across experiments.
  - software projects and support

- Education: yearly MC school (2010: contribution to CTEQ/MCNet School) plus typically one or two QCD/MC block courses.

- Concrete projects :
  - CASCADE MC generator using unintegrated PDFs. Used as framework for non-collinear MC generators and new parton shower developments
  - PDF4MC project: redefine standard + unintegrated PDFs for use in MC
  - PDF framework OOPDF (ANSI-C library, complementary to LHAPDF)
  - Tuning efforts within ATLAS (and CMS), across the experiments? (PROFFIT).
  - Validation tool HEPMCAnalysis with application to GENSER validation.

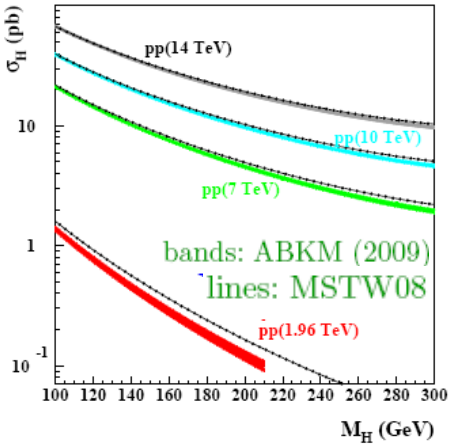
# AC Statistics Group

- core contributors: O.Behnke, C.Kleinwort, K.Kröninger (GOE), S.Schmitt, G.Flucke
- education:
  - typically two schools / year (one basic at DESY, one advanced elsewhere),
  - informal statistics meetings (1/month), software review meetings (1/year)
  - installation of discussion forums (to come).
- concrete projects and tool developements (contact person):
  - Millipede II: broken line fit (G. Flucke, C. KLeinwort)
  - LVMINI and APLCON: fitting tools (from F77 to C++) (V. Blobel + DESY)
  - Bayesian Analysis Toolkit BAT (A. Caldwell, D. Kollar, K. Kröninger)
  - TMVA : multivariate analysis techniques (E. von Toerne, + 2 DESY fellows)
  - Tunfold: unfolding program (S. Schmitt + new efforts at Mainz)
  - Gfitter: generic model testing (M. Goebel, J. Haller)
  - Fittino: SUSY parameter determination (P. Bechtle)
  - RooStatCMS: combination and limits (D. Piparo, G. Schott, G Quast)
- outcome: significant contributions to important statistics projects
- community support maybe improved (wiki, discussion forums etc.)
- in some areas closer collaboration with LHC experiments and stronger link of core people and RooStats and ATLAS/CMS statistics forum welcome

# AC PDF Group

- core contributors: J. Blümlein, S. Glazov, S.-O. Moch
- plus bilateral cooperation with AC,DO,FR,HD,KIT,…
- Mission:
  - support final HERA analysis w.r.t. PDF extraction
  - coordinate comparisons of different PDF analyses to refine understanding of PDFs and their errors, including alpha_s.
  - provide theoretical calculations for improved ep and pp analyses.
  - provide platform for analysis of inclusive hard scattering data at the LHC (DY, ttbar, H) to refine the understanding of the PDFs.
- Education: annual PDF school with lectures and exercises
- Goal:
  - final HERA PDFs and (maybe) a new global fit?
  - open-source code for NNLO structure function evolution for ep and pp inclusive hard scattering process analyses to extract PDFs.
- no general regular meetings, very limited user support
- maybe still a bit to concentrated around core contributors at DESY?

  → get more people in alliance involved and improve link to LHC community (transfer of knowledge, provide tools)



# WP2 Analysis Centre: Knowledge database

- Goal:
  - increase flow of information between partners
  - enable and increase synergies among partners
  - increase efficiency of collaborations

- collect and store activity and specific expertise of individuals and groups
  „ Who is knowledgable about electron identification in ATLAS in Germany?“
  „ Who can help me with jet calibration in CMS?“
  „ Who is leader of tau activities in the alliance?“
  „ Who is expert on matrix element and parton shower matching?“

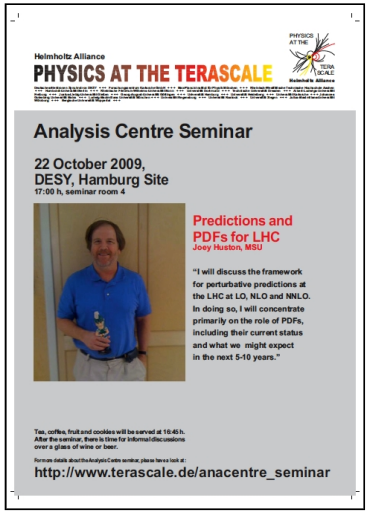
- status:
  - first call recieved limited response → no critical mass of information yet
  - give it a second try → please provide your expertise to the benefit of all

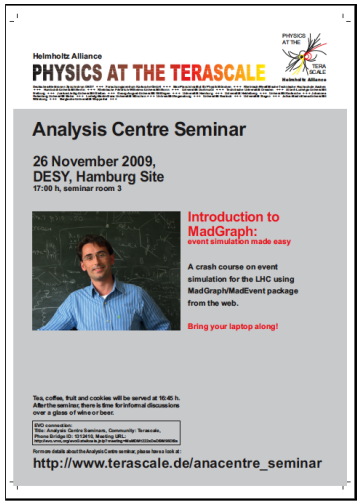
The success depends on you! Contact: anacen@desy.de

# WP2 Analysis Centre: new ideas

- studentship programme (similar to MCNET sholarships)
  allow students/postdocs to visit DESY for a few month to work on a project with members of the 3 analysis centre groups (~8 students/year, not approved yet)

- Analysis Centre seminar
  more analysis/tools related
  w.r.t . VTI seminars
  common future platform?
  - October 22: J. Huston: LHC and PDFs.
  - November 26: F. Maltoni: MadGraph
  - January: G. Schott: Roostats



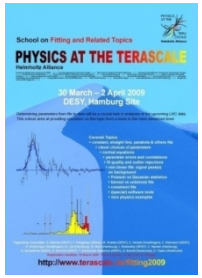



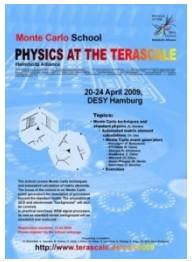

- more topical workshops maybe seeding new analyis working groups

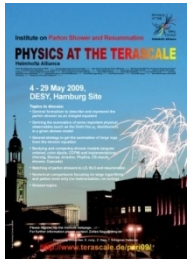
- plus some more ideas → ask Thomas Schörner-Sadenius et al.
  or let them know what you want and need

# WP3: Training and exchange

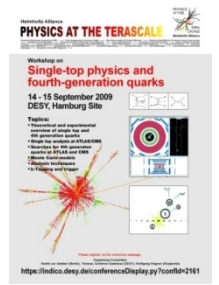
## Education and training events in 2009 (organised by Analysis Centre)

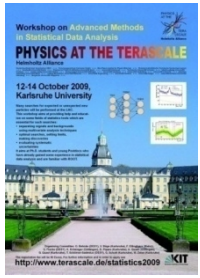


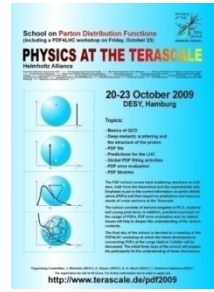




| Name | Date, place | Participants |
|---|---|---|
| CAPP09 | March, DESY | 30 |
| Fitting 2009 | April, DESY | 90 |
| MC 2009 | April, DESY | 75 |
| IPSR 2009 | May, DESY | |
| Detector Understanding | June, DESY | 65 |
| Single top | September, DESY | 25 |
| Advanced Statistics | October, Karlsruhe | 40 |
| PDF 2009 | October, DESY | 30 |


Clearly one of the highlights of the alliance projects

- very well recieved by students and postdocs
- excellent structure: interleaved lectures, tutorials, discussion sessions
- often seed for further cooperation btw. theory and experiment(s)

# Planned education and training events in 2010

| Name | Date, place | Participants |
|---|---|---|
| Statistics 2010 | Spring, DESY HH | 40 |
| Introduction to Terascale | March, DESY HH | 40 |
| CTEQ-MCNet School* | June, Black Forrest | |
| “Detector Understanding” | Unclear | |
| PDFs, MC, NLO | Freiburg, Autumn | 60 |
| Advanced Statistics | October, Göttingen | 40 |
| PDF 2010 | Autumn, DESY Zeuthen | 40 |
| C++ | DESY HH/Bonn | 40 |
| OO Design course | Dresden, Spring | 25 |

*contributions from Analysis Centre MC group.

- hopefully to be approved this afternoon
- a few not at DESY, but with huge support from AC
- which additional schools/ topological workshops would you consider to be useful and like to attend?

# New Analysis Projects

- call for proposal in July 09 in all areas analysis, grid, detector and accelerator
- 11 analysis proposal with total requested volume of 800 kEuro
- criteria for ranking as done by analyis project board:
  a) cooperation among different alliance partners
  b) importance for particle physics in Germany
  c) developement of infrastructure in the alliance
  d) feasability and scientific quality (weight of 3)
- 4 approved by management board each supported with 58 kEuro

  (1 postdoc year, another year from host institute or partner)

  1) Precise predictions for physics at the LHC (HH and FR)

  2) Proposal for an open-source code for precision analyzes of central inclusive and semi-inclusive hard scattering QCD processes in ep and pp-scattering (DESY-ZE)

  3) High Precision QCD Tools for the LHC (HH,AC,WU)

  4) Development of contributions to the Bayesian Analysis Toolkit (MPI,GO,DESY-HH)

# Attempt of a summary

- alliance has brought partners especially young people together
- schools and workshops are a highlight of the alliance
- stimulating and fruitful activities, projects and collaboration in alliance WGs, analysis WGs and the Monte Carlo network
- analysis centre established as a seed and coordinator for collaborations and developement of plentitude of new tools

But:

- still room for improvement, better and tighter and more intense collaboration
- fill and publish „expert data base“
- closer involvement of AC working groups in experimental collaborations
- improvement of documentation on web and wiki

The success depends on you!

“Twenty-one partners shall you be!“

in „Physics Analysis, Grid Computing, Detector and Accelerator Science“

freely adapted from "Elf Freunde müsst Ihr sein!“

Richard Girulatis in "Theorie, Technik, Taktik“ (1920)