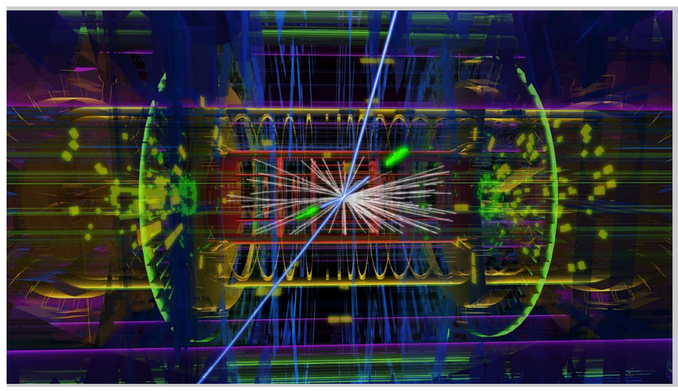


news

4/2015

Mass and Symmetries after the Discovery of the Higgs Particle at the LHC

GRK 2044

UNI FREIBURG

DFG

Dear all,
here is the last newsletter of 2015. To all of you joyful and relaxing holidays!
Merry Christmas and a Happy New Year!

DATES

All dates, news, and updates are given on the website of the GRK 2044: **www.grk2044.uni-freiburg.de**

Seminar series of the GRK

Remaining seminars on Wednesdays 16 s.t. of this term are:

Date	Speaker	Title	Abstract/pdf-file	time and place
13.01.2016	Stephanie Hansmann-Menzemer (Heidelberg)	Rare B Meson Decay Measurements at LHCb		HS II, 16 st
27.01.2016	Giuseppe Degrassi (Rom)	Vacuum Instability and the scale of New Physics		HS II, 16 st
10.02.2016	Pippa Wells (CERN)	Physics with the ATLAS experiment at the High Luminosity LHC		HS II, 16 st
17.02.2016	Iacopo Vivarelli (Sussex, UK)	SUSY searches at 13 TeV		HS II, 16 st
24.02.2016	Students talks	t.b.a.		HS II, 16 st

The planning of the seminar for the summer term has begun.
If you have suggestions for speakers, please contact Harald Ita and Markus Schumacher.

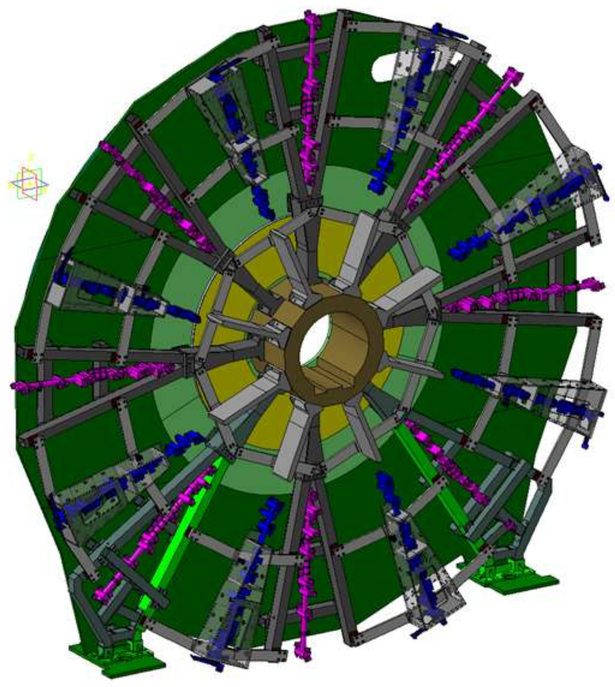
Thanks to all of you for a great annual fall workshop in Gengenbach!

PHYSICS: Latest results from the ATLAS and CMS experiments

After successful data taking at the LHC, the ATLAS and CMS Collaborations presented plenty of new results at the End-of-year seminar.
Have a look on: https://indico.cern.ch/event/442432/

SERIES: Members of our GRK: What's going on in the ATLAS Muon Upgrade ?

It feels like LHC and ATLAS just resumed data taking, after the two year long shutdown 1 (LS 1 shutdown), and much effort is spent in calibrating the detector for run-2, tuning operating conditions and providing the best performance for the new physics analyses at 13 TeV center of mass energy. However, in parallel and out of the spotlight, the Muon collaboration is also hard at work preparing to upgrade the detector in 2019/20 (LS 2), with the replacement of the innermost endcap Muon stations, the so called Small Wheels, on both sides of the interaction point by a new detector known, not surprisingly, as New Small Wheels (NSW).

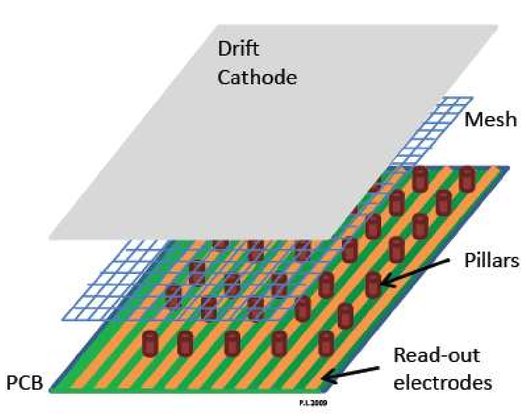


The NSW structure and mechanics

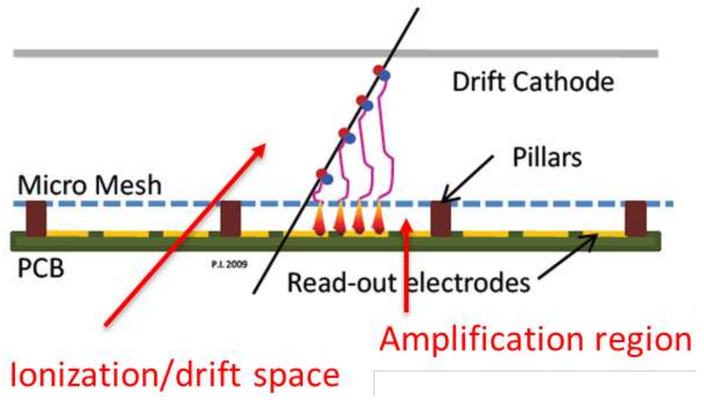
The NSWs will use MicroMegas and sTGC chambers for precision tracking and triggering, and be able to sustain the higher rates expected at the HL-LHC. In addition, the trigger concept will change: The NSW will provide trigger track segments for a passing muon particle with information on its direction and angle. These are then matched with the equivalent information from the Big Wheel to allow a much improved rejection against fakes as in the present muon endcap trigger.

The NSW project, where Freiburg is involved in the area of the MicroMegas chamber construction, cooling services, HV power supplies and alignment system, underwent several critical milestones in the last months: The Final design review for the Engineering part was passed at the beginning of November; Module-0 construction for both sTGC and MicroMegas is underway; major contracts for the chamber components to industry have been placed or are under negotiations; tests with prototypes of the NSW on-detector electronics with actual chambers have started.
2016 will nevertheless remain a critical year, which will bring in particular the ramp up of series production for the 128 MicroMegas and 192 sTGC chambers, all to be done in institutes. Stay tuned, not only for Physics but also the Upgrade times remain exciting !

If you want to see detector parts in reality, talk to the muon detector upgrade team:
Gregor Herten,
Thorwald Klapdor-Kleingrothaus,
Ulrich Landgraf,
Kim Temming, and
Stephanie Zimmermann,



Micromegas sketch of layout



Micromegas principle of operation

From the GRK PhD student speakers:

Dear PhD students,
first things first: a great thanks to Hannah Arnold for all the effort she put as a GRK students' speaker, for the work she did in improving the organization and communication among us, for the interest and precision in organizing events and seminars and for her patience in collecting and merging different ideas and inputs...once again, thank you!

Secondly, our monthly lunches have now become a tradition: we meet in front of the mensa every first Friday of the month at 12:30, as usual. This is the occasion to meet your fellow phd students, to discuss about whatever kind of problem or to voice your ideas / suggestions. Due to Christmas holidays, we shifted the next GK lunch to Friday, January 18th. So, don't miss it!

Speaking of collecting ideas, we discussed your suggestions for seminar speakers for the upcoming summer term with the professors. They are now being finalized from the professors' side and the speakers are about to be contacted.

We also want to keep the introductory talk before the GK seminar. Therefore, we're looking for people willing to give these short and colloquial introductions for the upcoming talks!
Note that the number of slides shouldn`t exceed 5.

Merry Christmas to all of you and have a good start in 2016!

Cheers,
Felix A. and Giulia

SERIES: Members of our GRK: Standard Model QCD: theory side

The vast physics programme of the LHC requires precise predictions for a large variety of processes. In particular, perturbative calculations within the Standard Model (SM) beyond leading order in the gauge couplings are indispensable in order to reduce theoretical uncertainties and to quantify them. With the increasing energy reach and amount of collected data, new theoretical methods are required in order to match the measurements' precision.

In the group of Stefan Dittmaier, several people work on QCD and electroweak corrections to SM processes. Philipp Maierhöfer is involved in the OpenLoops collaboration, which provides a library for the fully automated evaluation of all SM processes with NLO QCD and electroweak corrections, which in turn employs the library Collier (developed in the Dittmaier group) for the evaluation of the loop integrals. The program implements the OpenLoops algorithm to achieve very high performance up to high particle multiplicities. In collaboration with Monte Carlo groups this is used to perform realistic simulations for the ATLAS and CMS experiments at the LHC.

Apart from fixed-order calculations, renormalization group methods are able to predict and resum large contributions of the partonic cross section up to all orders. Timo Schmidt has been working on the soft and collinear gluon resummation in the dominant production process of a single SM Higgs boson at the LHC, the gluon fusion gg → H. Wladimir Tschernow and Timo Schmidt are elaborating analytical methods for the determination of scalar loop integrals.

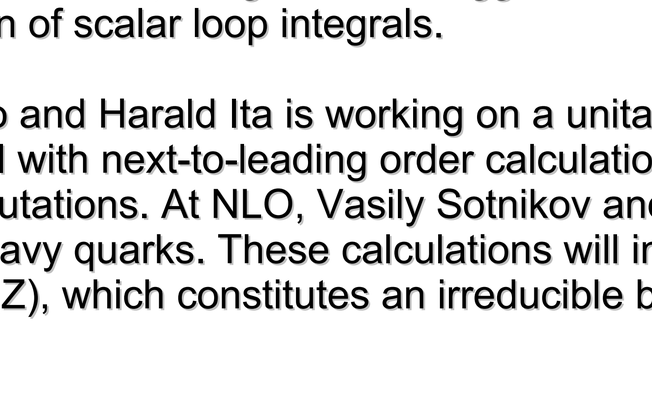
The group of Fernando Febres Cordero and Harald Ita is working on a unitarity approach for the numerical computation of loop amplitudes. On the one hand, they deal with next-to-leading order calculations for multi-particle processes, and on the other hand, they extend the methods to multi-loop computations. At NLO, Vasily Sotnikov and Felix Anger are working on QCD corrections for high-multiplicity processes including heavy quarks. These calculations will improve theoretical predictions for the associated production of heavy quarks and vector bosons (W,Z), which constitutes an irreducible background to a number of relevant processes at the LHC, for example WH and ZH production.

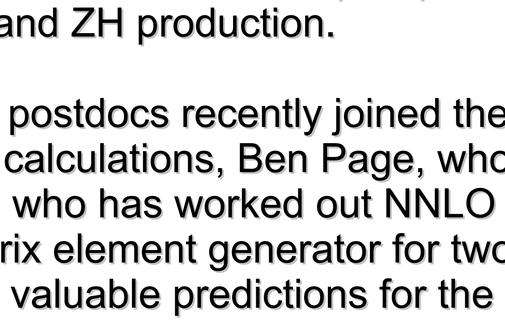
A number of new postdocs recently joined the effort towards multi-loop computations. Samuel Abreu, who also works on analytic methods for loop calculations, Ben Page, who has been working on a new regularization method for multi-loop computations, and Matthieu Jaquier, who has worked out NNLO QCD predictions for Higgs+Jet production, joined this quest. Evgenij Pascual has been working on a matrix element generator for two-loop amplitudes. These efforts aim at extending the functionalities of the BlackHat library to keep providing valuable predictions for the LHC experiments.

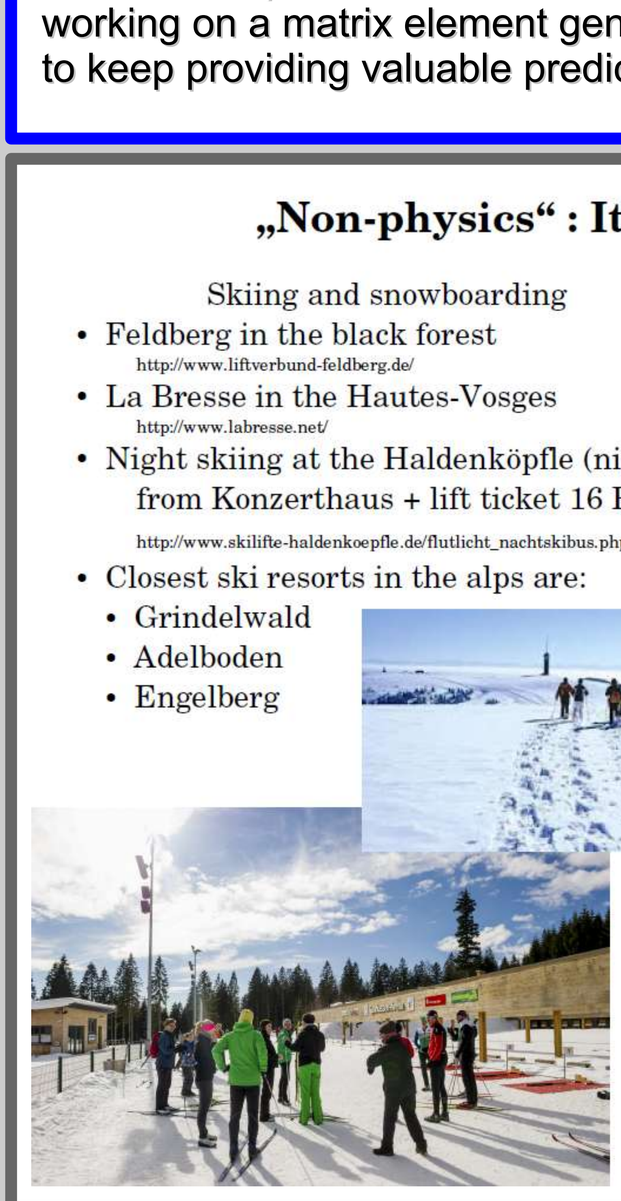
„Non-physics" : It's winter time (soon)

Skiing and snowboarding

- Feldberg in the black forest
  http://www.liftverbund-feldberg.de/
- La Bresse in the Hautes-Vosges
  http://www.labresse.net/
- Night skiing at the Haldenköpfle (night bus from Konzerthaus + lift ticket 16 Euro
  http://www.skilifte-haldenkoepfle.de/flutlicht_nachtskibus.php)
- Closest ski resorts in the alps are:
  - Grindelwald
  - Adelboden
  - Engelberg

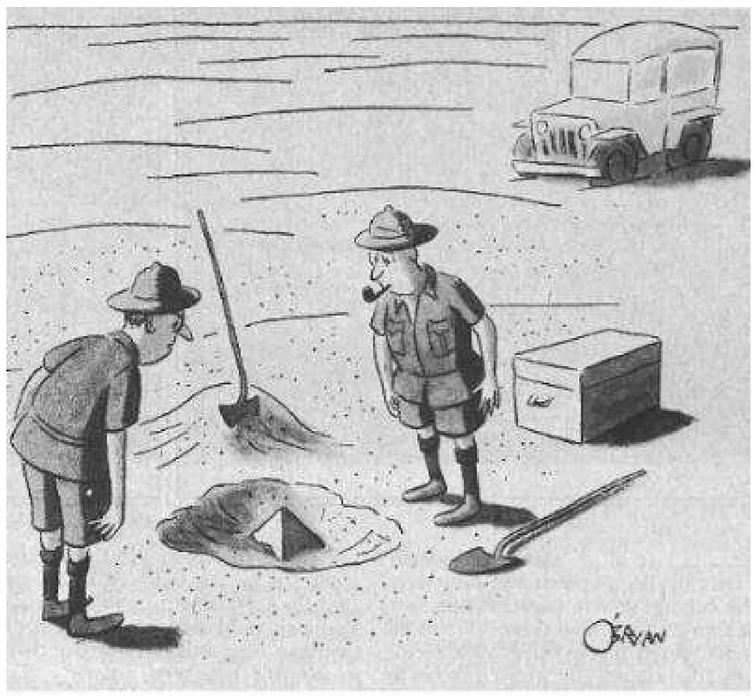






Snowshoeing, biathlon and cross-country skiing in the black forest

- Snowshoeing
  - http://www.schwarzwald-tourismus.info/entdecken/winterurlaub/schneeschuhtouren/schneeschuhtouren-im-hochschwarzwald
- Cross-country skiing
  - Thurner http://www.thurnerspur.de/
  - Notschrei http://www.notschrei-loipe.de/
- Or try biathlon
  http://www.nordic-schule-notschrei.de/notschrei-winterangebote.html



"This could be the discovery of the century. Depending, of course, on how far down it goes."

Thank you for contributions to: Felix Anger, Giulia Gonella, Philip Sommer, Stephanie Zimmermann and Susanne Kühn (Editor)