

# Welcome

9:15 – 9:45 Introducing DESY and the CMS group  
Introduction (Guenter)  
Test beam activities for the pixel (Hanno)  
Simulation studies for phase II (Thomas)

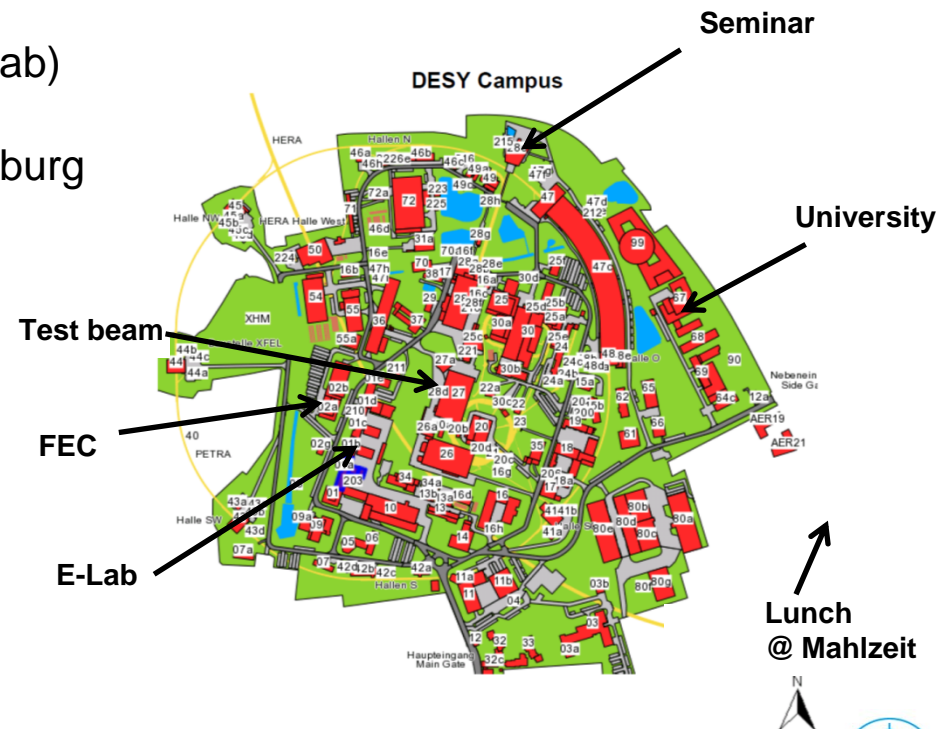
9:45 – 10:30 visiting the E-Lab and the test beam area

10:30 – 11:15 visit to FEC (electronics lab)

11:30 – 12:30 visit to University of Hamburg

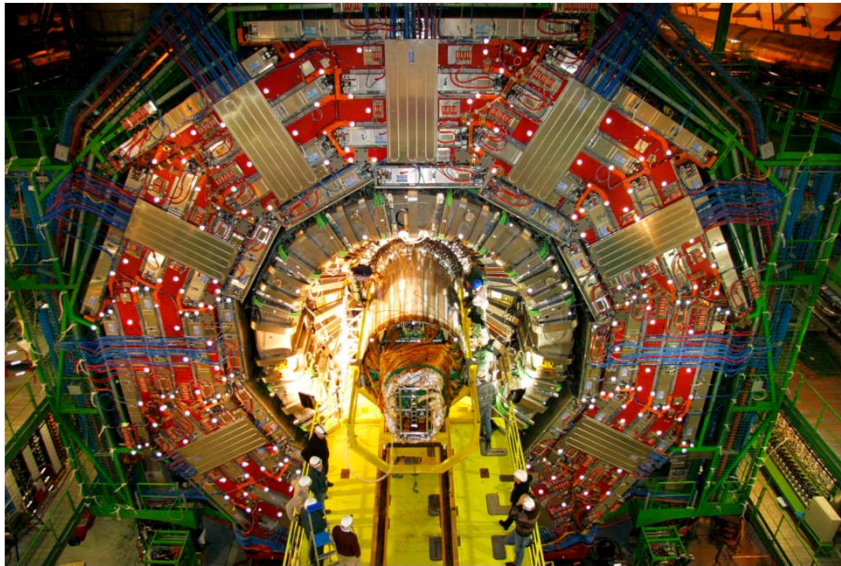
12:30 – 14:00 lunch

15:00 joint instrumentation seminar



# CMS @ DESY

## The CMS group at DESY



- DESY in a nutshell
- The CMS group at DESY
- Program for today

Günter Eckerlin

Introduction to visitors

June, 2012

# DESY in a nutshell

DESY is a research center of the Helmholtz Association



Established on 18 December 1959 in Hamburg

Locations : Hamburg and Zeuthen/Brandenburg (near Berlin)



Annual budget : 192 MEuro

90% funded by the German Federal Ministry of Education and Research,  
10% funded by the city of Hamburg and the Federal State of Brandenburg

2000 employees including 650 scientists

3000 guest scientists

More than 700 postdocs and students (doctoral and non-doctoral)

Working on

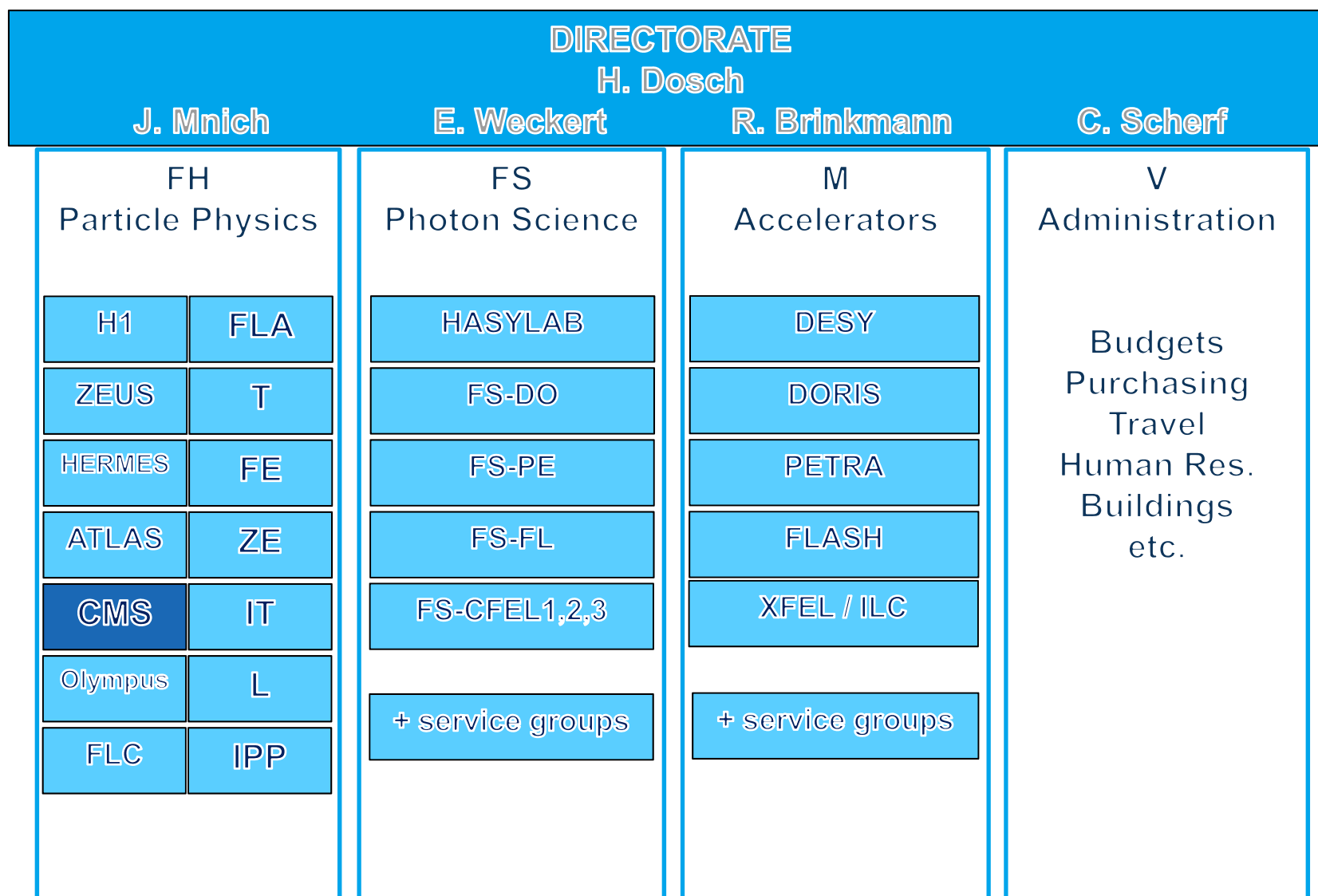
Accelerator science

Photon science

Particle and Astroparticle physics



# DESY organizational structure



# The CMS group

DESY is member of the CMS Collaboration since 2006

Current status (June 2012) :

- ~ 80 Members (6 in Zeuthen)

- ~ 50 FTE

  - 17 perm. staff

  - 18 students (doctoral and non-doctoral)

  - 1 engineer, 3 technicians (2xmech, 1xelectr.)

53 CMS authors (3<sup>rd</sup> biggest Institute of CMS)

Available infrastructure

DESY central workshops

- ZM central mechanics service group

- ZE central electronics service group

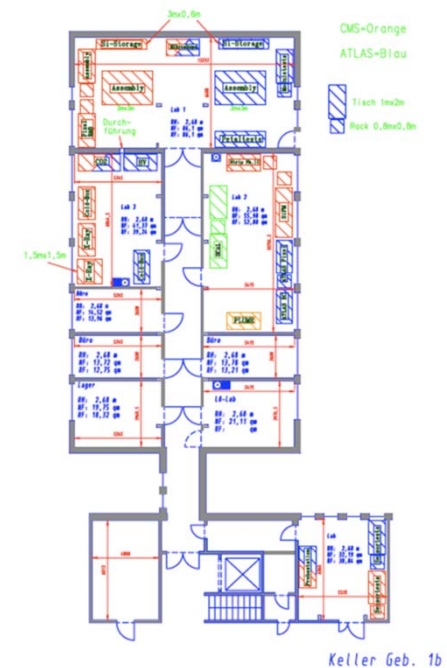
FH specific

- FE (electronic engineering group) ([visit of FEC](#))

- Electronic Lab (~ 200m<sup>2</sup> lab space + ~30m<sup>2</sup> 'clean room')

- FH-Mechanics workshop (~200m<sup>2</sup>)

Close cooperation with Univ. Hamburg



# The CMS group – organizational structure

Head of the Group - K.Borras ; Deputy - G.Eckerlin

Physics - A.Meyer

Top

M.Aldaya  
A.Meyer

Higgs

A.  
Raspereza

SUSY

I.Melzer-  
Pellmann

QCD

H.Jung  
Th.S.-S.  
K.Borras

PDF

K.Lipka

Components and Operation

DQM

A.Meyer

Tracker

G.Eckerlin

Alignment

R.Mankel

Computing

M.Kasemann

BCM

W.Lohmann

CASTOR

HLT/DAQ  
K.Borras

Upgrade - G.Eckerlin

Workshop and

technical staff

K.Borras

G.Eckerlin

I.Gregor (ATLAS)

Pixel

D.Pitzl

G.Eckerlin

Tracker

G.Eckerlin

W.Lohmann

HCAL

K.Borras

I.M.-P.

BCM

W.Lohmann

A.Raspereza



# DESY tracker upgrade activities

## Phase I - pixel barrel layer 4

Daniel Pitzl, Doris Eckstein, Hanno Perrey, Alexey Petrukhin, Shiraz Habib, Armin Burgmeier  
Luigi Caligaris, Thomas Eichhorn, Jan Hampe (FEC)

Setup of module production center (in cooperation with Univ. of Hamburg)

Module test and cold calibration

Test beam and source (presentation by Hanno Perrey)

x-ray calibration (see visit to University of Hamburg)

b-tagging simulation studies for HLT (pixel only) (Maria Aldaya, Jan Olzem)

## Phase II - tracker

Andreas Mussgiller, Doris Eckstein, Hanno Perrey, Thomas Eichhorn,  
Zeuthen : Wolfgang Lohmann, Wolfgang Lange, Matthias Bergholz

DESY is member of the CEC (HL-LHC tracker R&D)

HPK campaign

diode campaign coordination (Doris Eckstein)

sensor(diode) characterization (see visit to University of Hamburg)

sensor simulation (presentation by Thomas Eichhorn)

Modules & new materials

FEA, deformation setup, new materials, ...(Andreas Mussgiller)





# Program for today

9:15 – 9:45 Introducing DESY and the CMS group  
Introduction (Guenter) **almost done !**  
Test beam activities for the pixel (Hanno)  
Simulation studies for phase II (Thomas)

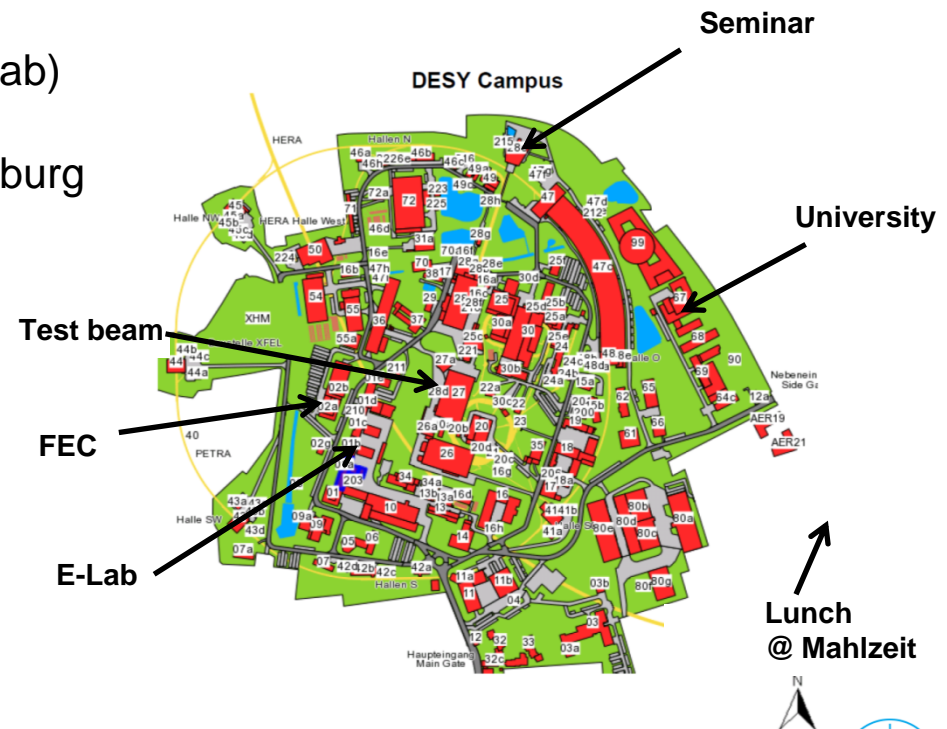
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# Backup slides



# Testing CMS Pixel in the DESY test beam

Daniel Pitzl

EUDET  
telescope:  
3.5  $\mu\text{m}$   
resolution

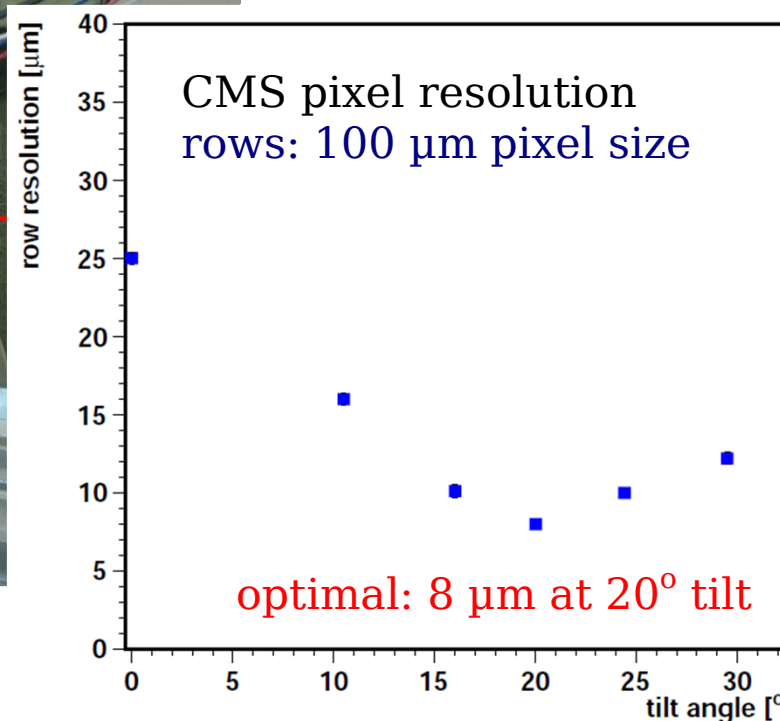
common  
scintillator  
trigger

CMS  
pixel

data taken Dec 2011

beam 21:  
6 GeV  
positrons

up to  
30° tilt

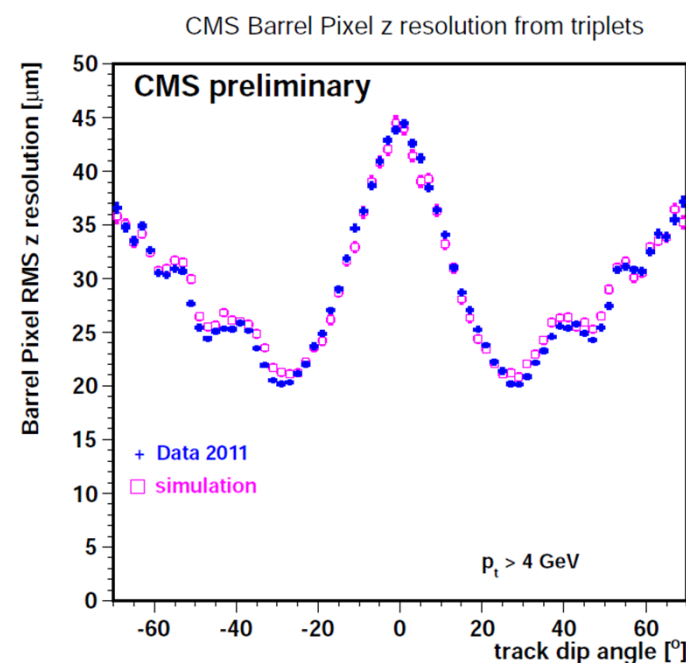
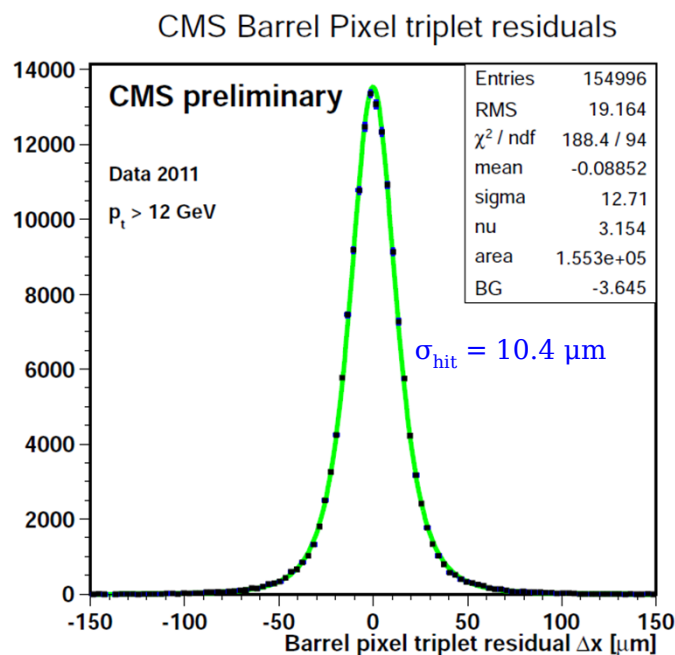
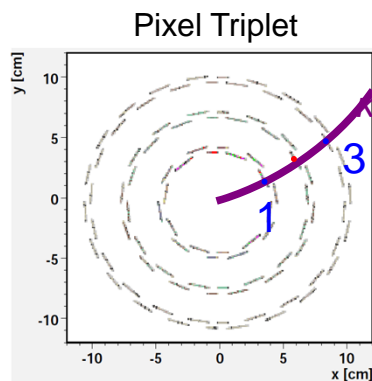


in CMS: 20° Lorentz angle  
for electrons in Si at 3.8 T.



# Example of DESY activities for pixel upgrade in 2011

Daniel Pitzl

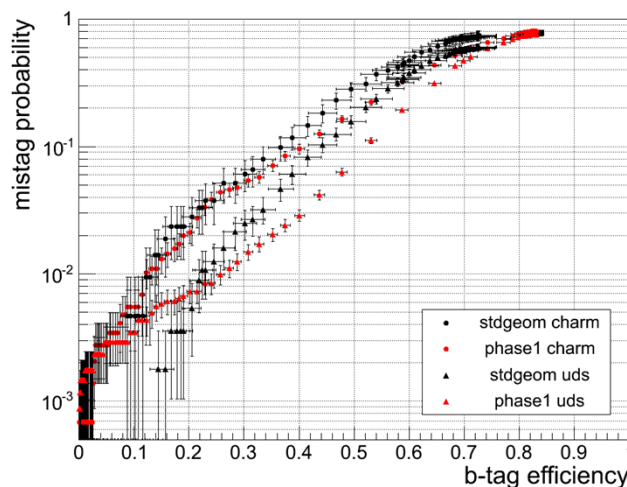


Maria Aldaya, Jan Olzem

MC study of B-tagging with 4 layer BPIX

Simulating pileup 50 including inefficiency

improved mistag probability for phase 1 compared to standard geometry



# Pixel Bump Bonding Tests (example Pac Tech)

**Solder bumps were placed and reflowed successfully**

Jan Hampe

PLANNED PROCESS AND LASER SCAN AND OPTICAL MICROSCOPE PICTURES

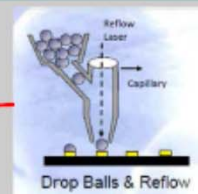
Planned and tested Solder Ball Jetting process



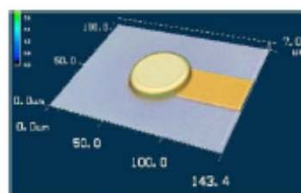
UBM at Pac Tech



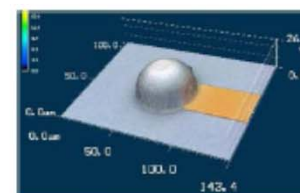
SB² Jet



Jetting 40  $\mu$ m Solder Balls



Pad with processed UBM



Pad bumped with 40  $\mu$ m solder ball



Side view of bumped daisy chain structure on chip

# Phase II – Tracker Module R&D

Andreas Mussgiller, Jan Olzem

Detailed FEA simulation of modules  
thermal and mechanical

essential input for module design

thermal and deformation tests  
in preparation to validate results

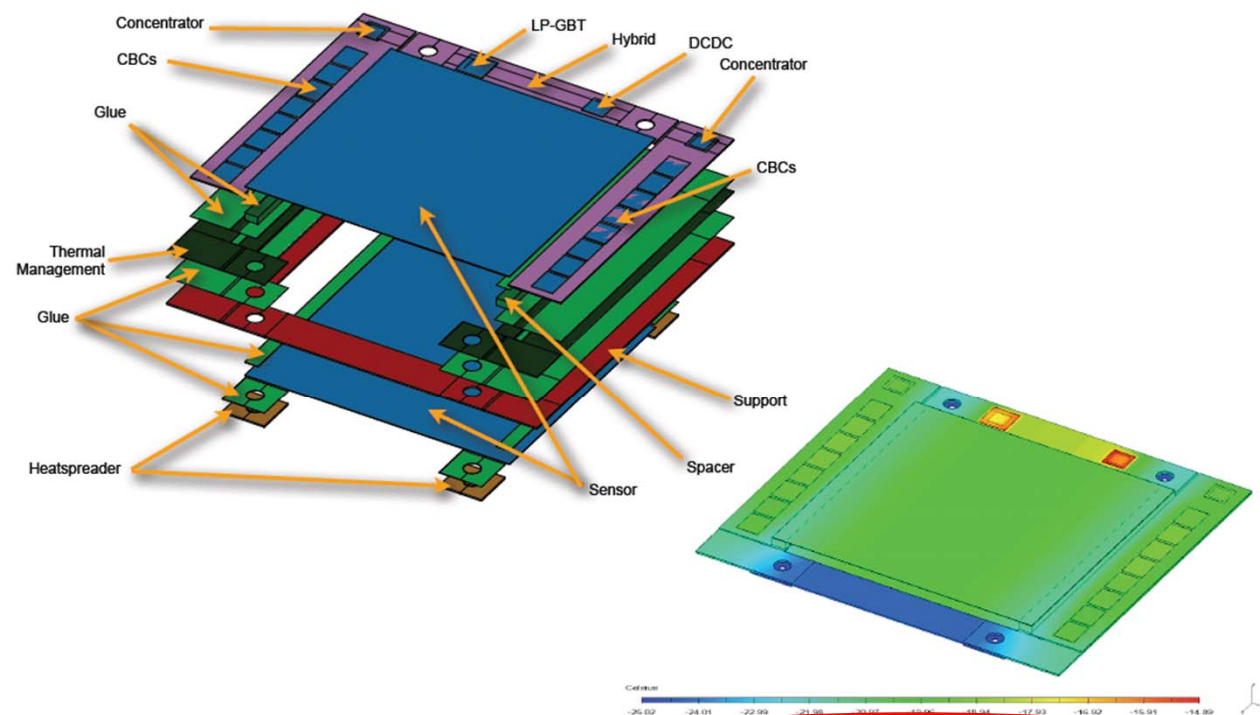
ODM ready by end of Aug. 2012

will help to characterize materials

will be used to test prototypes

plan to build and test prototypes at  
DESY in cooperation with FEC

## Design and FEA of the 2S Module



- 2 strip sensors with a spacing of 1 mm - 4 mm
- Concentrator chip correlates signals from both sensors to form a Pt trigger
- Trigger will be used in LI

• A prototype is going to be built by the end of this year





## Involvements in Phase 2 upgrade:

### **CEC (HPK Campaign):**

- diode sensor programme coordination (Doris)
  - have to finish irradiations and measurements this year 2012 to be able to contribute to sensor material choice
- device simulation (Thomas) starting now
  - Embedded in sensor WG , coordinated by Alberto Messineo

### **Setup of clean room with Probe station + ALIBAVA setup + TCT setup:**

- test of any strip sensors in the Lab with Laser and source (Doris +?)

### **Eudet/AIDA Telescope:**

- Gaining experience in using Eudet Telescope at DESY Testbeam (Thomas, Hanno)
- Close collaboration with ATLAS colleagues
- ➔ Will enable us to test strip sensors with ALIBAVA readout and in future also CMS readout here at DESY



## Involvement in Phase 1:

- Testbeams with Eudet telescope and pixel module (Hanno, Thomas)
- Soon setup of clean room with Probestation etc. (Doris +?)

