Tabuk University at Belle

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- Tabuk University is full member of Belle II experiment and involved in the PiXel Detector (PXD) made of DEPFET sensors.
- Brief summary of the University of Tabuk (UT).
- So far accomplished within the Belle II PXD.
- Plan for UT activities within the DEPFET collaboration.

Tabuk University Final Design

The Campus will house all academic and Social utilities with faculty housing, Student Dorm, and Hospital.
Some Collages final building were already Finished.
Full Construction will be finished by 2015-2016

Campus Now and Campus in few Years

About 1000 Full–Time Faculty and teaching staff in The whole university.

About 20,000 Students

Campus Area:12 million m^2

About 30 Faculty members in the Physics Department

My Career In Particle Physics

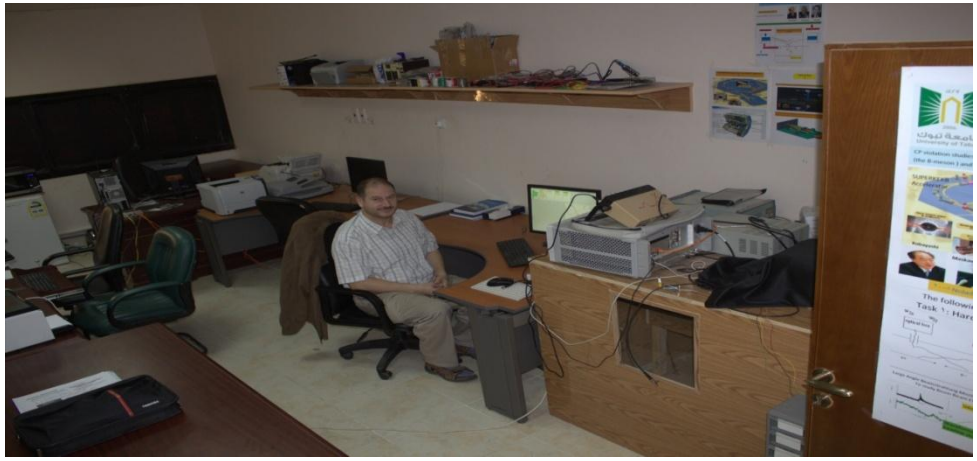
- PhD (1989) with University Of Savoie (France) involved in L3 experiment.
- CERN(1990-1996): Involved In ZEUS/HERA experiment working on the Leading Proton Spectrometer(LPS)
- 1996-1998: Istituto Nazionale di Fisica Nucleare (INFN), continue working on LPS/ZEUS
- Syracuse University (1998-2000): Involved in CLEOIII/CESR
- Temple University (2000-2008): DRIFT I experiment for Dark Matter Search and in 2007 I joined BaBar experiment.
- 2009-2010: Sultan Qaboos University (Oman)
- 2010-Present: University of Tabuk
- BaBar Tasks: I found a method to improve Tracking pseudo-efficiency by 1.2% and analyze data (here below).
- Teaching: Particle Physics at the graduate level (RQFT, S-Matrix, Feynman Diagram and Standard Model) at Temple University (USA) and now at the University of Tabuk.
- Many Academic accomplishments at the University of Tabuk: Accreditation with the UK Institute Of Physics (IOP), new Bachelor of Science in Physics, starting a Master of Science in Physics.

Tabuk Particle Physics Group at work

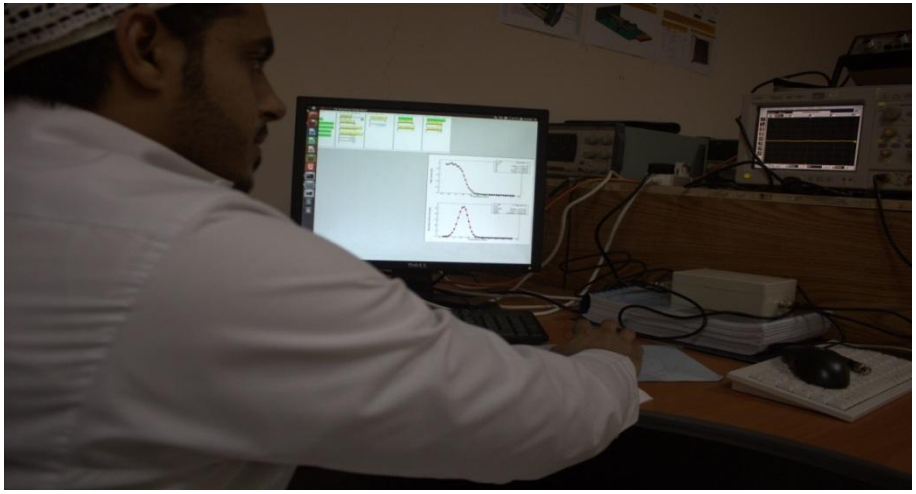
Students with
Faculty member

Offices

Myself in the Lab

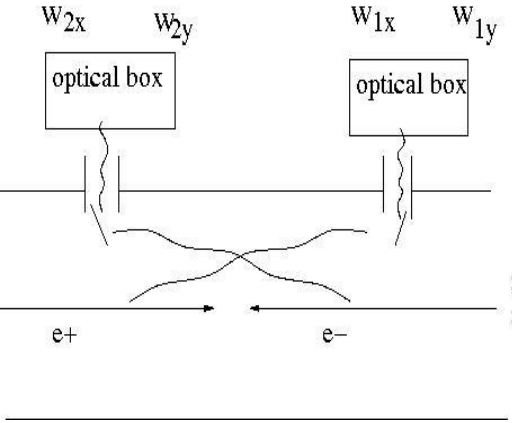


A student taking SiPM data (using RootGUI)

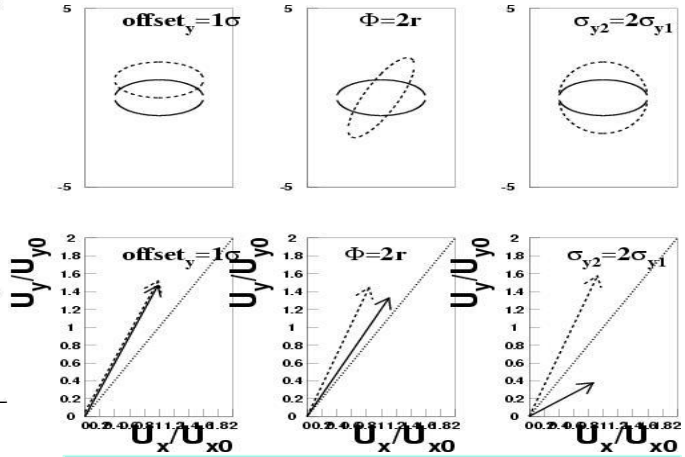


So far done at Belle II (I)
Study of Beam-Beam Instability, The Large Angle Beamstrahlung Monitor (LABM) at Belle II, Leaded by Giovanni Bonvicini (WSU)

Large Angle Beamstrahlung Monitor for Beam-Beam Instability

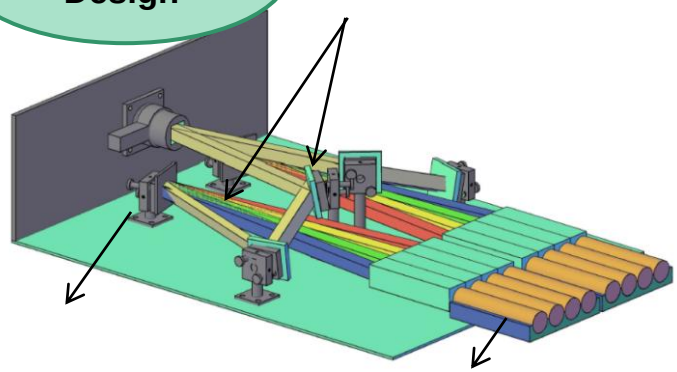


- **Large Angle Beamstrahlung Monitor (LABM)**
- **To study Beam-Beam Instability**

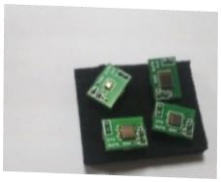


Beam-Beam instability Pattern recognition

Optical box Design

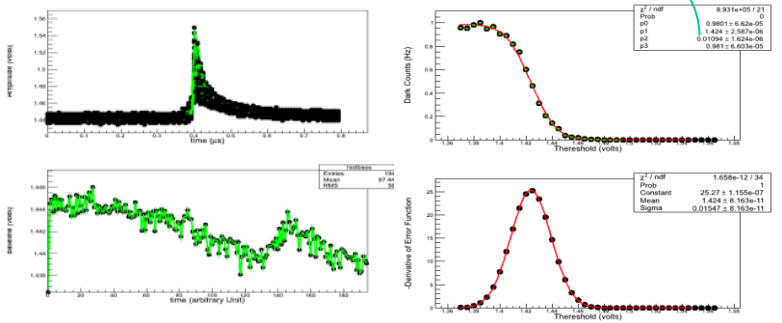


Silicon PMs tests at Tabuk by Rachid and Chaouki

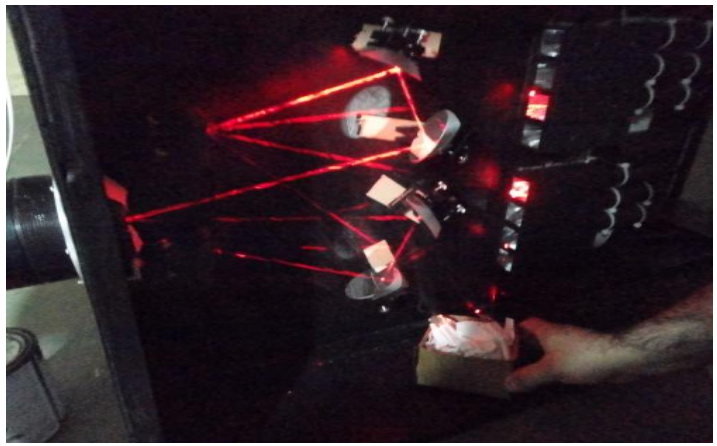


Waveforms and baseline study

Finding Threshold



First Prototype Of the Optical Box tested by red light



So Far Done within Belle II PXD (II)
CDC-VXD Tracks Merging (started by Abdelouahab and now taken over by Benjamin)

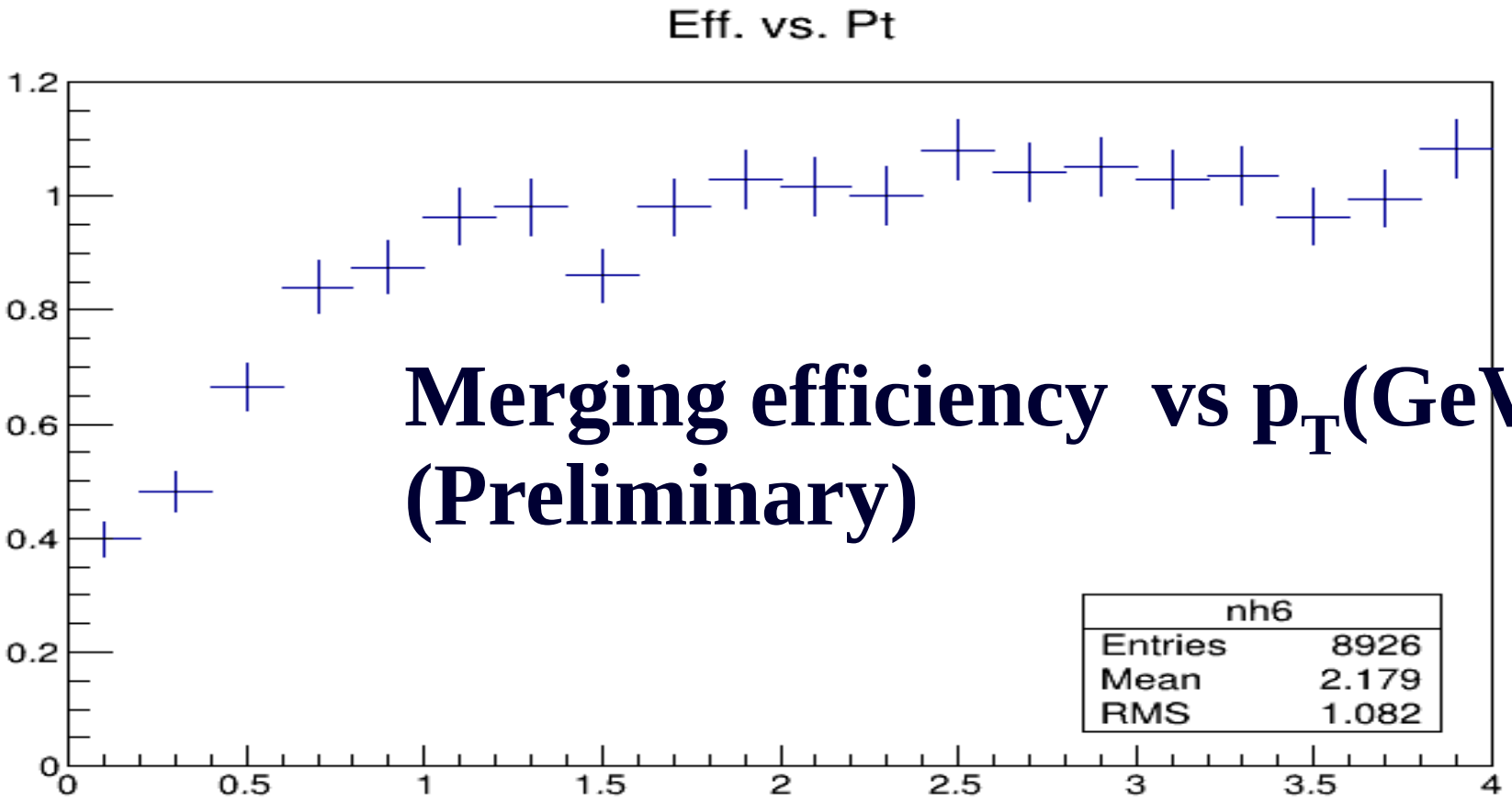
- A module has been developed and the code is now published to Belle II software framework.

- The matching criteria is based on chi-square merging hypothesis of Central Drift Chamber (CDC) tracks with VerteX Detector (VXD) tracks at the CDC wall (between CDC and PXD). The CDC-VXD merged tracks pair is chosen for the smallest chi-square.

- Track merging efficiency versus P_T (see next slide)

- Try to use Jan-Feb 2014 DESY testbeam data to merge Telescopes tracks with VXD (SVD and PXD) tracks.

So far done at Belle II (PXD Task)
Performance of Track Matching

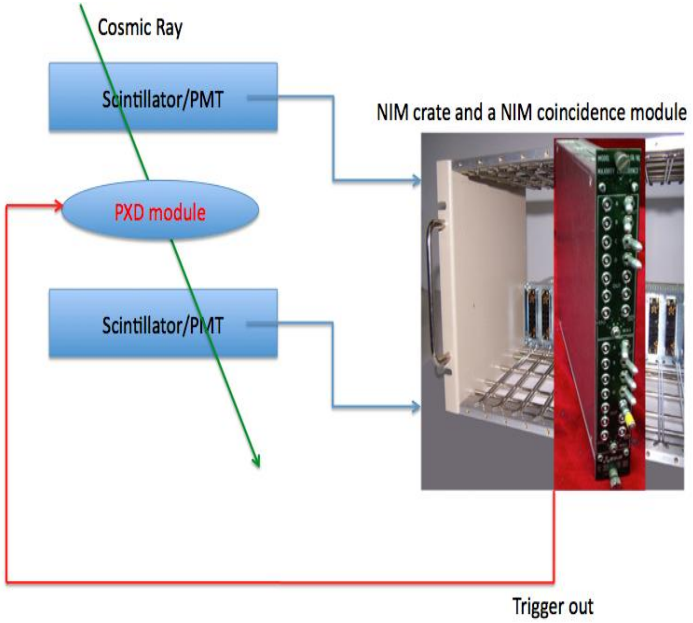


Merging efficiency vs p_T(GeV) (Preliminary)

Main and Possible contribution to DEPFET activities

Aim: Two main tasks (cosmic tests at Tabuk and at KEK)

At Tabuk
(Starts Spring/Summer 2014)



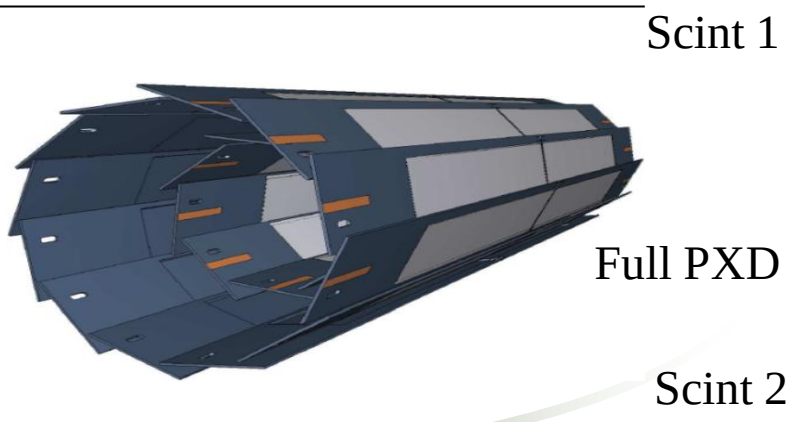
Our near goal is to test the Large PXD modules at the bench with Cosmics. Use the opportunity of the 1(2) years period before PXD installation to:

1) Determine the pedestals and noise characteristics
2) Study the detection properties of the PXD modules using tracks: such as: efficiency, cluster size and shape, signal height, gain.
3) Study the uniformity of those properties across the module.
4) Study stability of those properties as function of time.
5) Study the dependence on environmental parameter (temperature, humidity …).
6) Optimize the operational parameters to obtain the best overall performance.

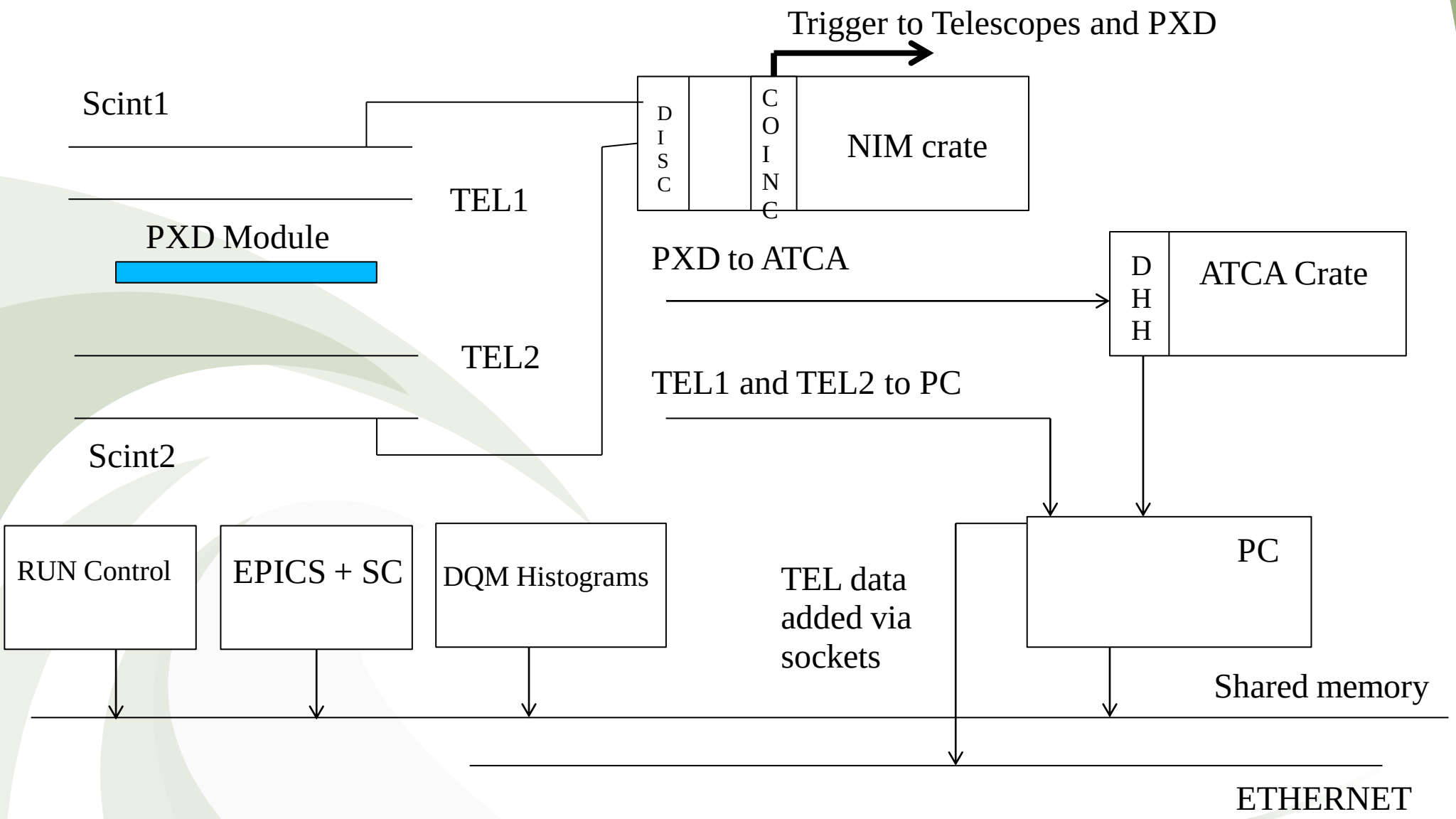
At KEK before installation

(Starts when PXD(with SVD) at KEK (Summer 2015))

If time allows we go through all what had been planned at the bench but mainly we will concentrate on efficiency using Silicon Vertex Detector (SVD) tracks, and maybe telescopes tracks to merge them with VXD(SVD/PXD) tracks



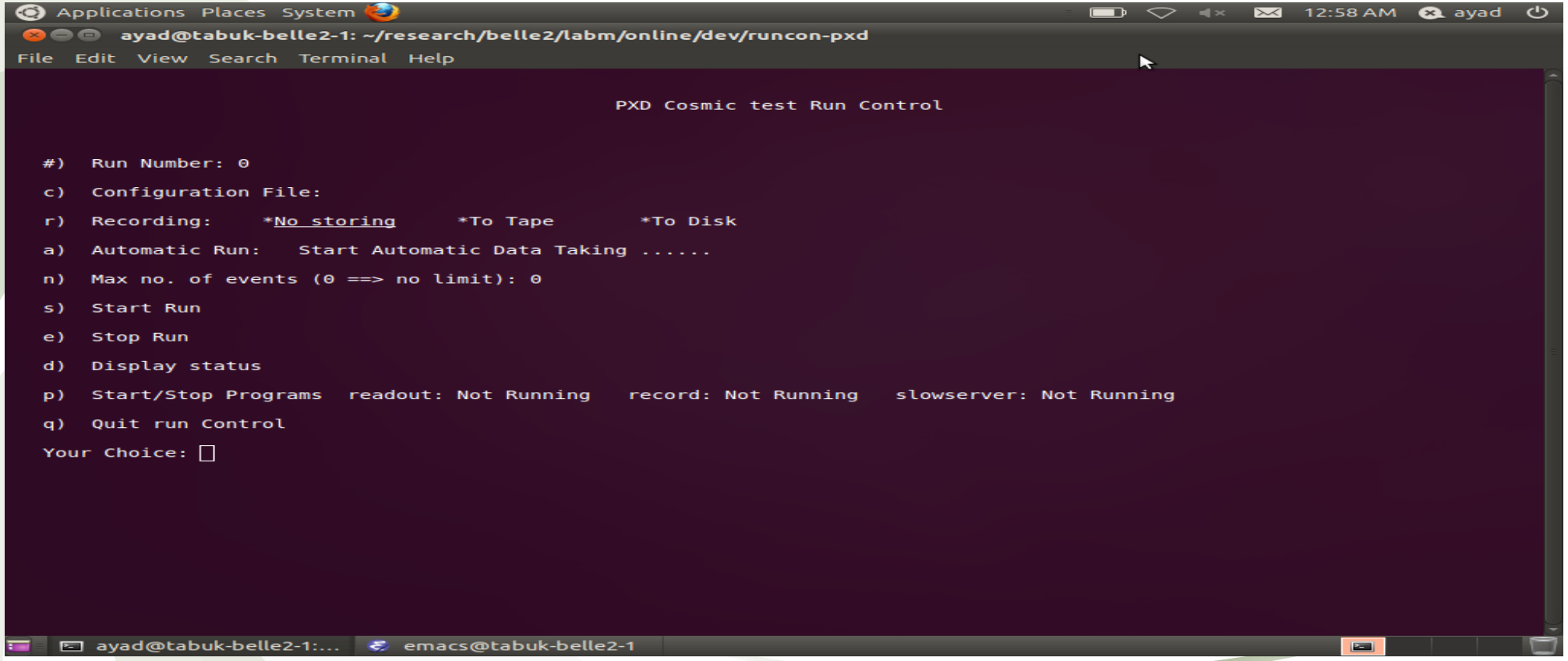
What is needed in the cosmic test



At run

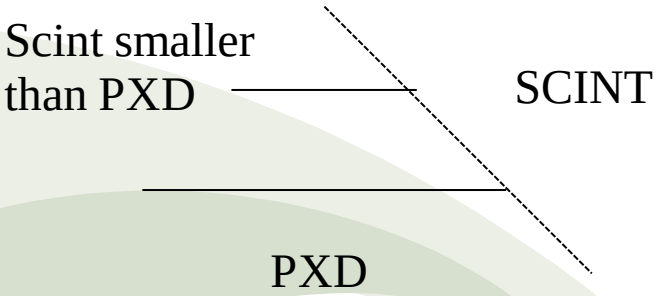
Maybe is better to use standalone Run Control Task instead of using the EPICS GUI to operate the DHH. Just connect The EPICS process to our Run Control Utility via Shared memories. Like this we will not interfere in the DHH EPICS utility and have our changes done only within our Run Control Utility.

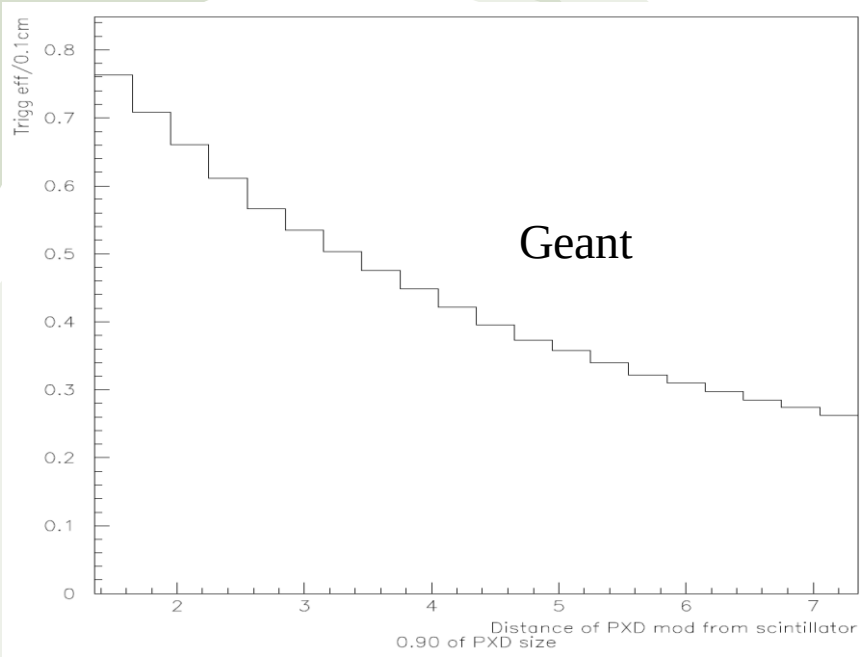
Already existing Run Control program



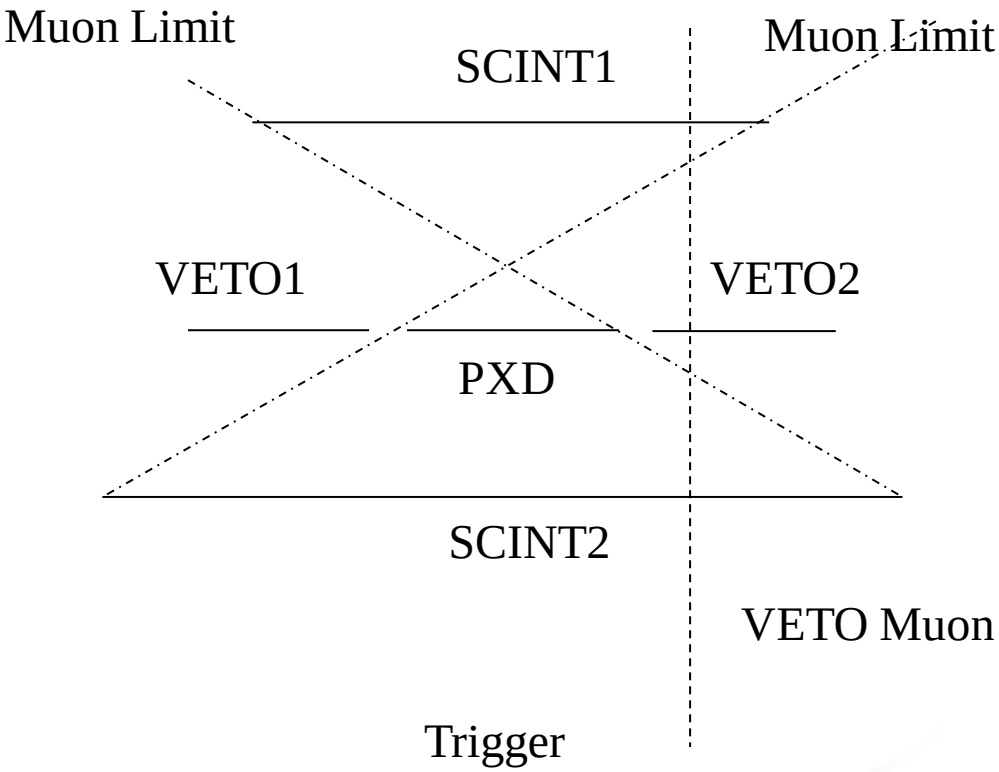
Setup Status I
Trigger Scintillators

1. Scintillators will be done at MPP and PMTs from HAMATSU
2. Design parameters will depend on HAMAMATSU PMTs





SCINT Larger: More space and rate



(SCINT1.AND.SCINT2).AND.(NOT.VETO)

Setup Status II
Telescopes (From ALIBAVA, Spain)

We will use ALIBAVA (Spain) silicon detector system. Custom design is allowed.
Detector boards on demand as uv strips or pixels.

Telescopes sensitive area should match final cosmic tests at KEK. Just we knew yesterdaythat Tabuk will also take care of the cosmic tests at DESY so parameters values sent today to ALIBAVAcompany and a skype meeting is scheduled next week. ALIBAVA Tracker system high cost, worth to discuss the issue well.

	Radius	Ladders	Pixel 1	Pixel 2
Layer 1	1.4 cm	8	250x256 (50µm x 55µm)	250 x 512 (50µm x 60µm)
Layer 2	2.2 cm	12	250x256 (50µm x 70µm)	250 x 512 (50µm x 85µm)

The area to cover seen from top (4.4x6.2)cm^2 for full acceptance for normal incidence cosmics
We will discuss how many detector boards we need and with what sensitive area. Custom demand !!

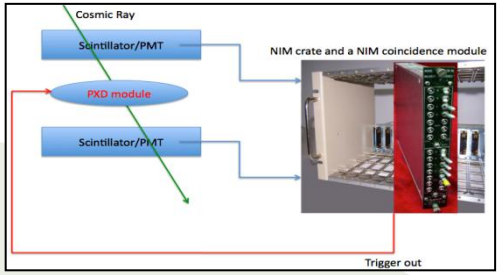
FanIn/Out board

Detector board

Merge Two tasks after merging tracks
(test basf2 tracking merging module)

Cosmic tests at the bench and at KEK

Bench tests



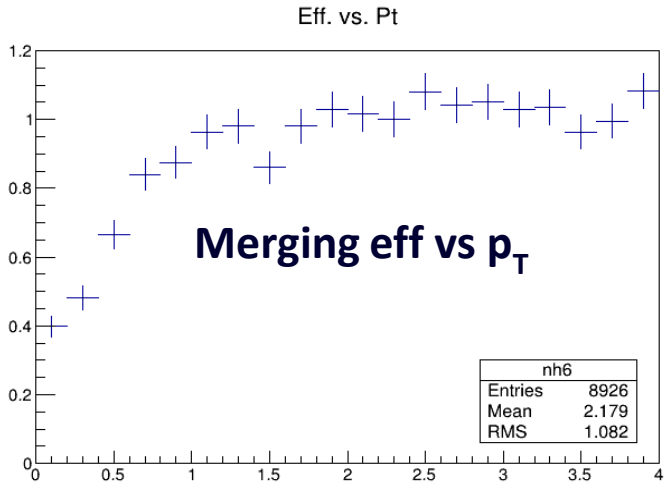
At KEK

1) Determine the noise characteristics of the PXD modules.
2) Study and tune the operational bias voltage of the modules.
3) Study the detection properties (including efficiencies) of the PXD modules using real tracks.
4) Study systemtatics

CDC-VXD tracks merging
(Benjamin)

A module already
Published and in a
About few weeks a
New version will be
Published.

Tracks merging works
So far with MC tracks



The two efforts will merge for the VXD cosmic run at KEK:
1) Standalone (PXD-VXD only) by end of 2015
2) With Belle II detector in 2016 (first test before data taking)

Manpower Status and others tasks

- **Current Manpower**:

  - Benjamin: Track merging, testbeam analysis, DHH, EMCM

  - Chaouki Boulahouache: testbeam analysis, cosmic DAQ, DHH, EMCM

  - Vipin: EPICS

  - Said: Partcipate in cosmic tests activities at Tabuk.

  - Myself: Mainly working to setup cosmic tests

  - Tabuk is funding a PostDoc at MPP (Valentin) to test and commission EMCMs.

  - PhD students will be involved in DEPFET activities (3-4).

- **Schedule**:

  - Benjamin and Chaouki will be at Munich to learn about the DAQ (DHH), for a full period of two months. Also participate in the gated mode and learn about EMCM operation.

  - By May 2014 PXD modules will be at Tabuk for cosmic tests

  - By summer 2015 when VXD will be at DESY, either Ben, Chaouki, or Vipin will be at KEK preparing for the cosmic test.

- **Possible new task:** Helping on testing EMCMs (it is now in discussion with Hans).

Conclusion

- University of Tabuk applying for DEPFET membership and already accomplished tracks merging tasks at Belle II
- The main task within the DEPFET collaboration is to setup cosmic-ray tests at the Bench (Tabuk) and at KEK with full Belle II VXD
- Tabuk is funding a PostDoc based at Munich testing and commissioning EMCMs and others four Faculty members from Tabuk will be also involved in DEPFET tasks. Also PhD students will be involved in DEPFET activities.
- At Tabuk others tasks than the Belle II PXD modules cosmic tests could be considered like testing EMCMs depending on the training of two of Tabuk members at Munich (March/April). This task is in discussion with Hans Moser.
- We really thank all members of the DEPFET collaboration to consider our application for DEPFET membership.

Backing Slides