Report to JCPC

Hafeez Hoorani

CERN, Geneva

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EHEP GROUP

EHEP Group at NCP

Physicists		06	
Hafeez Hoorani	Shamona Fawad	M Irfan Asghar	Saleh Muhammad
Imran Malik	**Jamila Butt**		
Students		**14**	
Taimoor Khurshid	Muhammad Ahmad	Wajid Ali Khan	Muhammad Shoaib
M.Phil Students (4)	MS Student – KU (2)	Other Univ. (4)	
Engineers & IT Professionals		**10**	
Waqar Ahmed	Ishtiaq Hussain	**Hassan Shahzad**	Sajjad Asghar
Usman A. Malik	Fawad Saeed	Tanzeel Murtaza	Saqib Haleem
Sobia Idress	**Adeel-ur-Rehman**		
TOTAL		**30**	

Manpower at CERN

- **Three summer students from NCP:**
  - S. Khalid, M. A. Shah, M. Suhail
  - One student from Punjab University – DG CERN award for the best student
- **RPC M&O** – one person H. Shahzed
- **CMS offline computing:** A. Rahman, S. Idress
- **Physics** – Jamila Bashir (Postdoc)
- **Two PhD students in couple of months:**
  - Taimoor Khurshid (Top Physics)
  - M. Ahmad (Quarkonia Group)
- **One PhD student is supported by funds from DG (30 kCHF)**

Manpower for RPC

Hassan Shahzad is present at CERN for a period of one year from 15th Oct 2010 till 14th Oct 2011.

- **Main duties are as follows:**
  - To assure smooth and stable operation of HV and LV system for Endcap RPCs.
  - Take shifts as RPC Operation Manager in CMS control room.
  - Involvement in RPC Run coordination duties as deputy Run Coordinator for RPCs.
  - As a DCS expert, he is involved in the DCS upgrades related to Endcap RPC DCS.
  - In-charge of RPC test setup in Building 904 which is used to test and assure the good HV and LV boards & cables.
  - Prepared dedicated application in PVSS to monitor and store the information for these tests.

Software Development

- **Development of GUI for CMS RPC configuration database**
  - Two NCP software developer working remotely with RPC experts at CERN
  - Efforts of 4 man-months
- **Working with ATLAS – TDAQ Team**
  - Gateway Analyzer System
  - Redmine – Project Management web based
  - SMTP Log Analyzer
  - Logwatch Script

FUTURE: Setting up "ATLAS Computing Helpdesk" in Pakistan
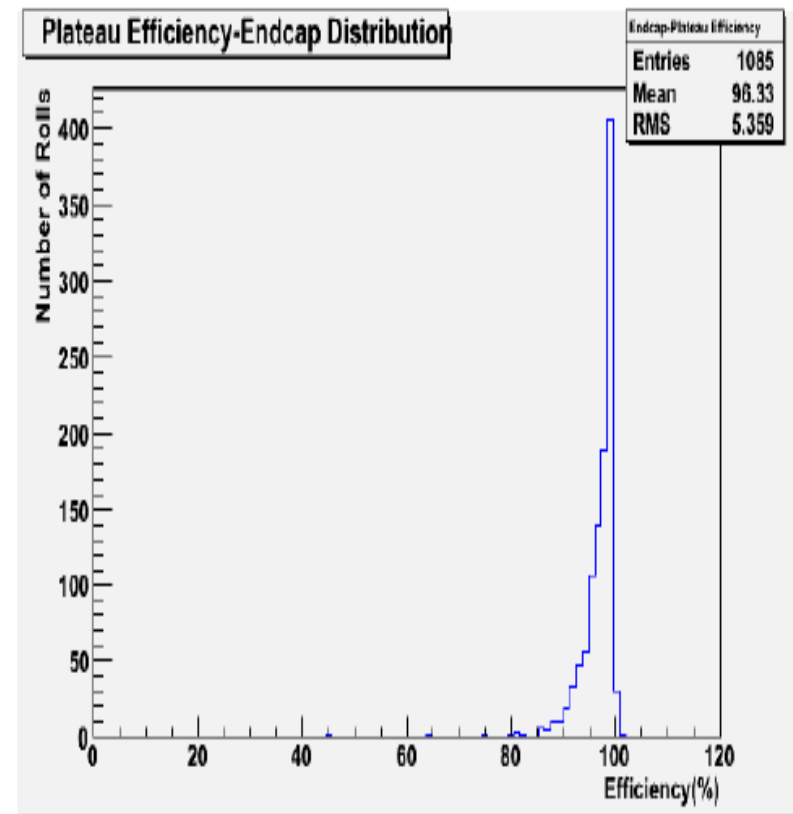
ENDCAP RPCs

RPC Endcap

- 288 RPCs installed in CMS cavern on 4 different stations which were assembled, tested, installed and commissioned by Pakistan.

- RPCs are in global runs of CMS since September 2008 and give good results in terms of efficiency, cluster size and strip profiles.
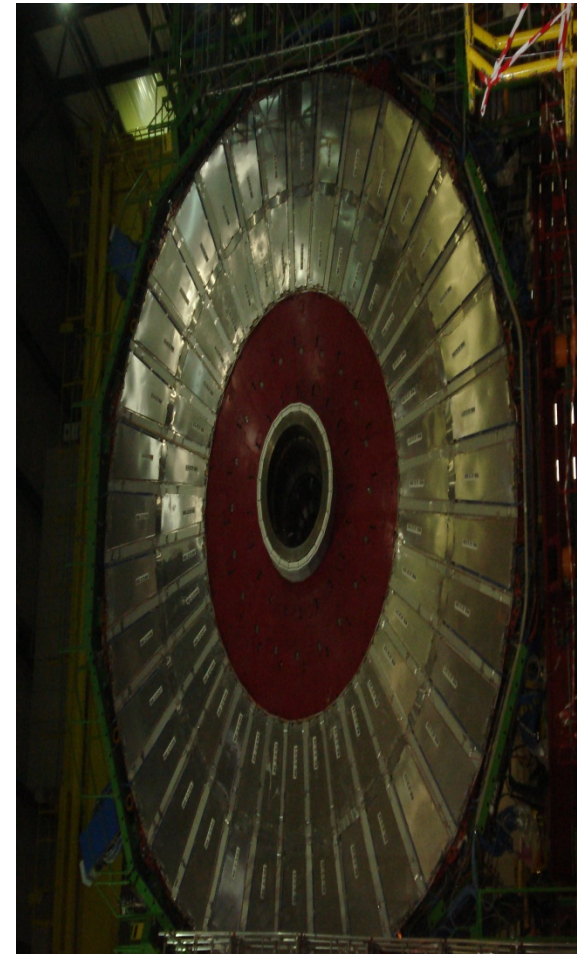
HV Scan test

- Recently for fine tuning of RPCs, HV scan test was performed.

- 11 HV points were taken from 8.5kV to 9.7kV.

- The main goal is to calculate the optimal working point for each RPC.

Values could be > 100%, this is an efficiency extrapolation towards infinity.

HV Scan test

- The analysis on HV Scan Results and the generated plots show a good stability of the Endcap RPC system.

- HV Scan analysis is very satisfactory after cross checks by RPC data analysis experts.

- The new HV values predicted were set in the detector.

- The cluster size and the efficiency behave as predicted: we understand the system.

Maintenance of RPC

- **Problems arising during the normal operations and running of RPCs:**

- **HV Channels trips:**
  - Expect 2 to 3 HV channel trips in 4 to 6 weeks which can be cured by replacing the connector or use a good spare cable with connectors.

- **HV/LV board problem:**
  - HV/LV board stops working, solution is to replace the board with the spare one (~ 2 months)

- **Gas Leak:**
  - In Jan 2011 annual gas leak test, the results show that RE is a very good leak tight system i.e. the overall leak in 6 RE stations is approximately 70 liters per hour.

- **Coolant leak:**
  - They occur very rarely and currently 6 RPCs are Coolant by pass due to leakage.

- **Threshold Control:**
  - Loose DCS cable in link board or faulty FEB. Solution is to recheck the DCS cable and replace the FEB.

RE Hardware status

Total Endcap RPCs at SIX stations are 432
Except few problems which are mentioned below, rest of the RPC system
is working well.

Problems Type	Number of the effected RPCs	Status
High voltage	**01**	**OFF**
High voltage	19	Single gap mode, working
Low voltage	**02**	**OFF**
Threshold control	07	working
Coolant by pass due to leakage	6	working

# GRID OPERATIONS

Grid Operations

- New and robust network infrastructure deployed for corporate and LCG network (May 2009)
- NCP-LCG2 site is running with latest middleware versions
- **NCP Grid Node is used both for CMS & ALICE**
- According to WLCG C-RRB, in 2011 with 33 CMS Tier-2s, cumulative requirements are as follows:
  - 319500 HEP-SPEC06 of computational power
  - 19900 TB of disk storage.
- Commissioning of higher bandwidth link STM1 (155 Mbps) in collaboration with HEC
- ***Signed WLCG MoU mentions only 42 Mbps (Major Problem)***

Resources For CMS

NCP-LCG2	Installed	Pledged		
	2011	2011	2012	2013
CPU (HEP-SPEC06)	5219	4352	5440	5440
Disk (TB)	176	300	300	300
Network (Mbps)	155	53	66	66

❑ **NCP-LCG2 site is connected with 155Mbps R&D link through TEIN3, GEANT2, and Internet2 as provided by PERN-2 (Pakistan Educational Research Network).**

Comparison between Installed and Pledged CPU Resources (2010-11)
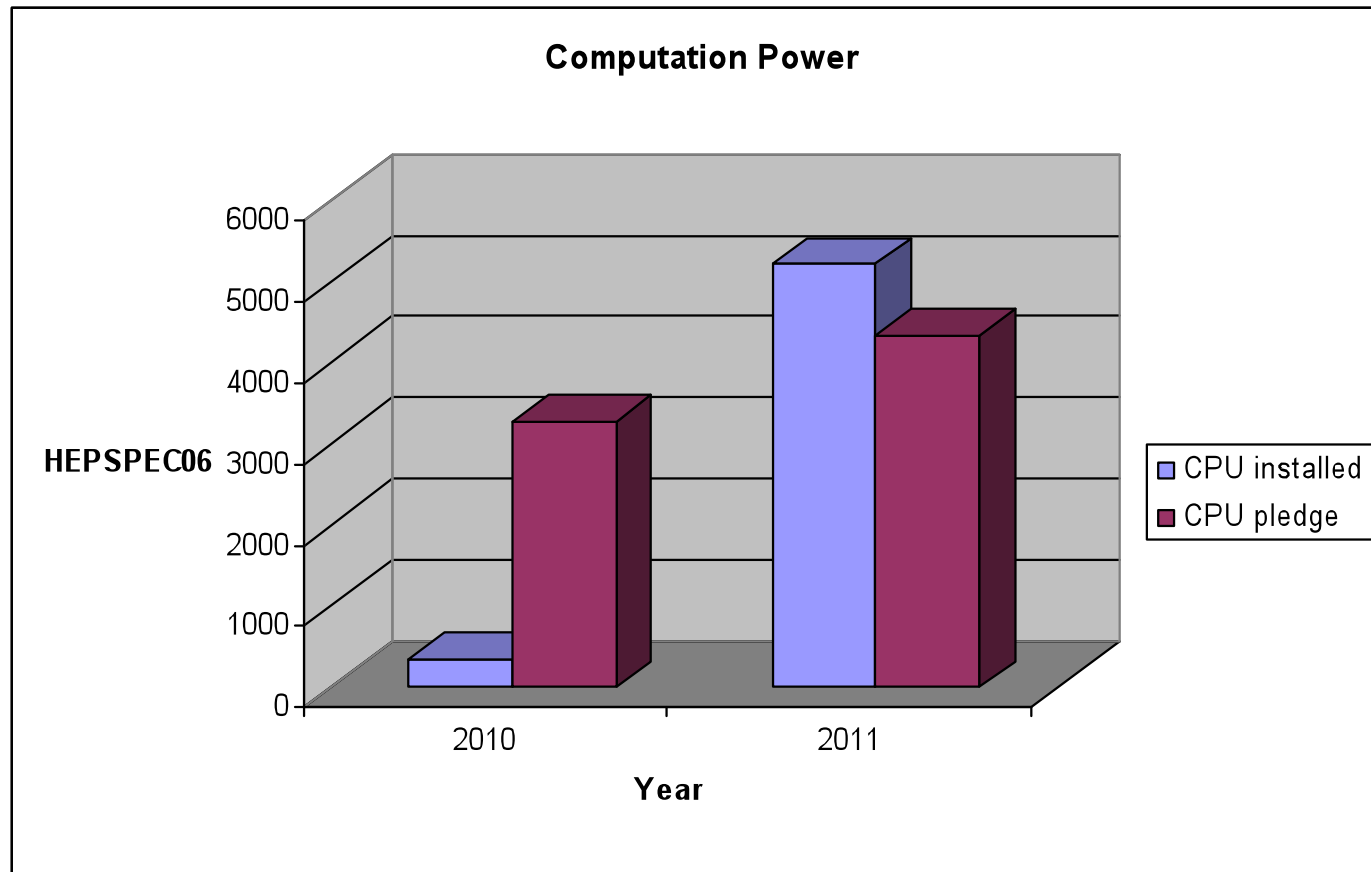
Comparison between Installed and Pledged Disk Resources (2010-11)
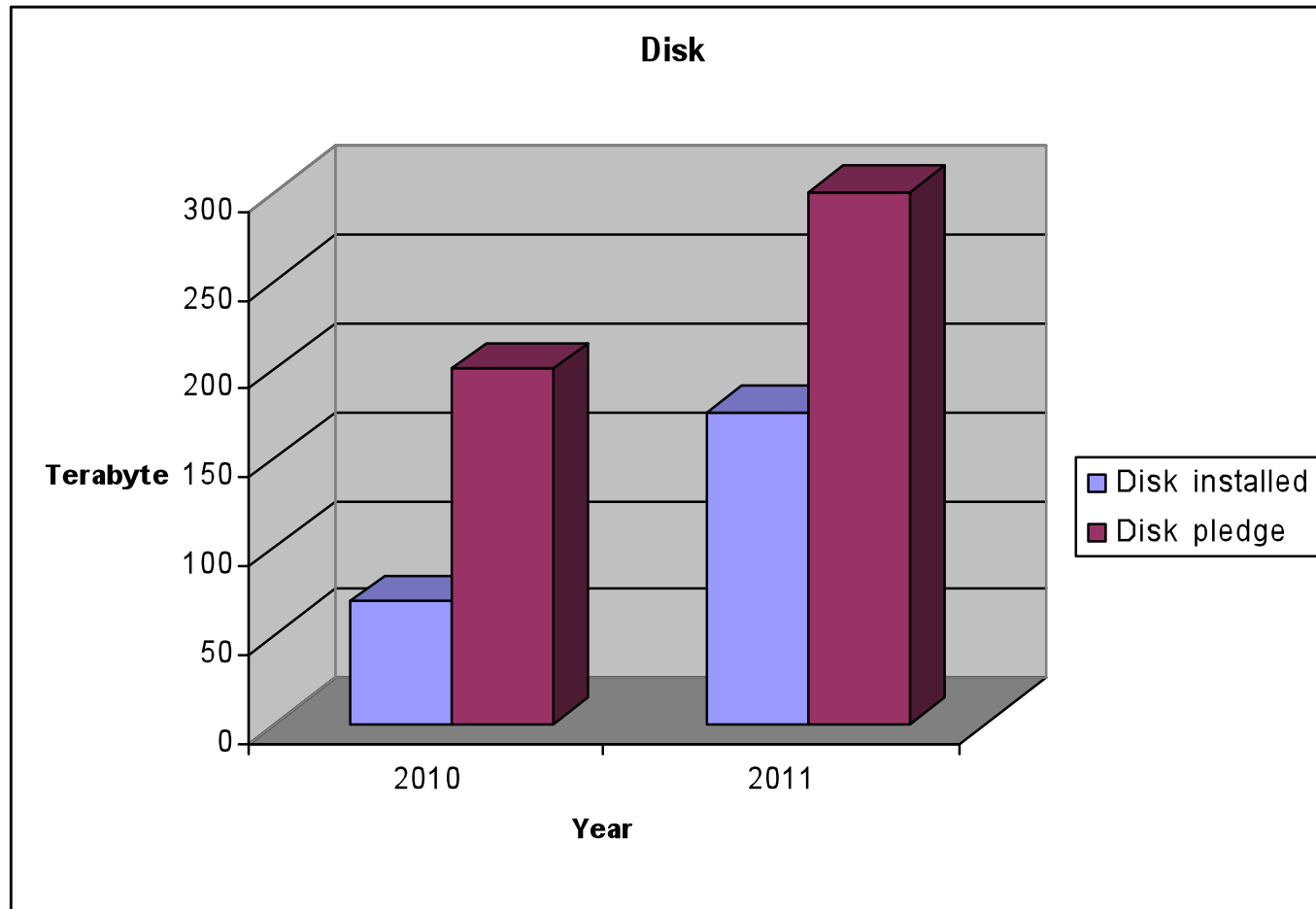
EGI Accounting Statistics
Year 2011

	Normalised CPU time (KSI2K-hours)	Normalised Elapsed time (KSI2K-hours)
Jan	36,928	54,232
Feb	100,795	118,087
March	64,015	85,411
April	124,881	132,262
May	217,370	227,214
Total	543,989	617,214

CMS UPGRADE PHASE 1 & 2

RE – 4 Project

- Three major task are responsibility of Pakistan:
  - Production of Front End Electronics for RE4
  - HV Distribution Boards preparation
  - RPC Commissioning & Installation

Readout Electronics

- **Total Chambers = 200**
  - On YE-4 =144
  - Spares = 56
- **Chambers production sites: CERN, Belgium, India**
- **Read out Electronics:**
  - Front End Boards
  - 3 FEB/Ch
 - Total required = 600
  - Spares = 50
  - Total = 650

Readout Electronics

- Prototyping completed (tested in Pakistan and at CERN)
- Purpose: Reading out 32 detector strips.
- **Distribution Boards (DB):**
  - 1 DB/Ch
  - Total required = 200
  - Spares = 50
  - Total = 250
- Prototype under progress
- Purpose: To communicate remotely with chamber from control room.

Readout Electronics

- **Adopter Boards(ABs):**
  - 6 ABs/Ch
  - Total Required = 1200
  - Spares = 50
  - Total= 1250
- Purpose: charge collection from detector to FEB.

Gases Electron Multiplier (GEM)

70 µm   140 µm   50 µm
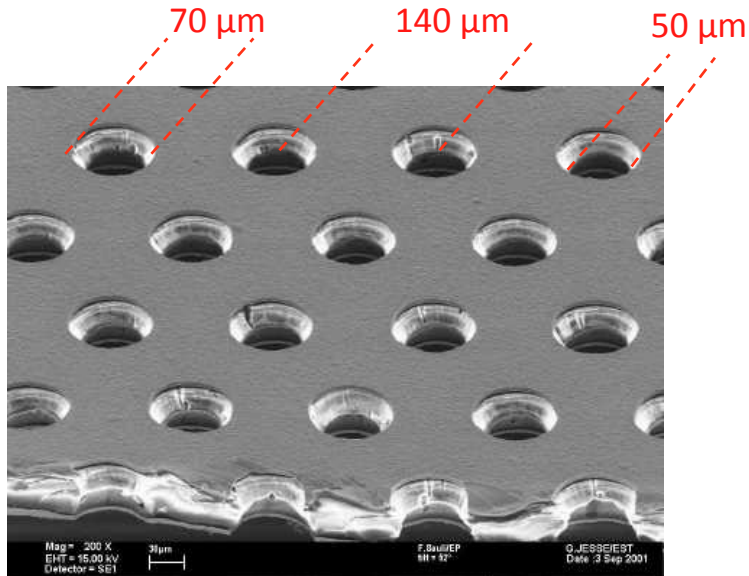
A Gas Electron Multiplier (F.Sauli, NIM A386 531 1997) is made of 50 µm thick kapton foil, copper clad on each side and perforated by an high surface-density of bi-conical channels.

By applying a potential difference (300 - 500 V) between the two copper sides, an electric field as high as 100 kV/cm is produced in the holes acting as multiplication channels for gaseous detectors.

conversion and drift

amplification

transfer
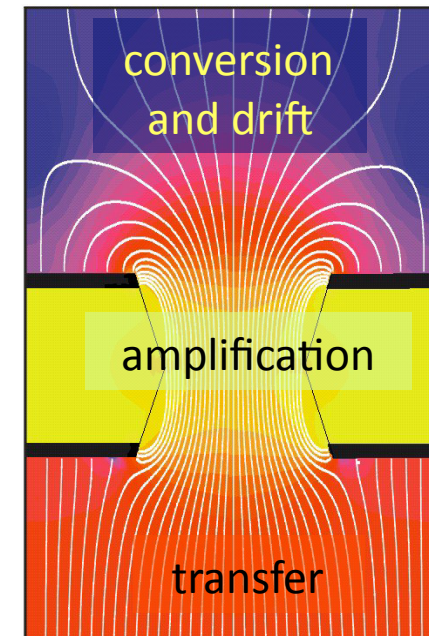
PAKISTAN HEP NETWORK

Motivation

- **Pakistan is part of LHC project**
- **320 muon chambers have been contributed**
- **We have full access to LHC data**
- **Means of access are also available in the form of Tier – 2 Grid Node**

1. **Bring various universities and institutes in Pakistan together**
2. **Generate activities related to LHC in HEP theory, phenomenology and experiment**
3. **Define the mechanism and dynamics of how various HEP groups in Pakistan can work together**
4. **Gather support from HEC, PAEC, and CERN for the sustainability of these activities**

We need the vision, guidance, and support of senior theorists:

- **Riazuddin, Fayyazuddin and Kamaluddin Ahmed**

Present day situation

- Govt. of Pakistan funding CERN – Pakistan cooperation through PAEC

- NCP is the focal point in Pakistan

- NCP has a Tier -2 Grid node operational

- NCP Grid node has CMS and ALICE Grid

http://www3.egee.cesga.es/gridsite/accounting/CESGA/egee_view.html

- NCP is the only institute as full member of LHC Experiment (CMS)

Present day situation

- Institutes in Pakistan lack critical mass and require funding
- Any other institute from Pakistan wants to become a full member of a collaboration at CERN, needs to fulfill many conditions
  - Decent size physics group
  - Proper experimental facilities
  - Computing infrastructure & network connectivity
 - Funding to sustain the group

HEP network

- Create a network of universities interested in HEP
- Institutes such as PU, KU, Comsats, CHEP, LUMS and NCP join hands and support **PhD students**
  - PhD Students registered in Pakistan having a local supervisor and a mentor at CERN
  - Get associated with NCP
  - Same policy for theory and experiment
  - CMS data can be used by students for their PhD work
  - Published papers will have the name of the student

HEP network

- National Committee headed by **Prof. Riazuddin** to look after HEP network

- Have one member from each institute and one ex-officio member for PAEC and NCP

- Any student going to CERN must do the following:
  - Well-defined research proposal
  - Local PhD supervisor
  - Mentor at CERN
  - Application should be processed through the National Committee

- For such a network initially some funds can be made available by PAEC and possibly CERN

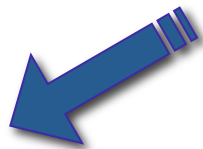- All available opportunities related to CERN should be advertised to this network

HEP Network

PhD Students 44
Experiment 23
Theory 21
PhDs 18
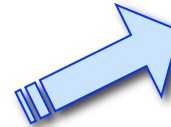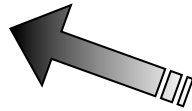
PAEC
Funding Agency –
Signatory of cooperation
agreement

Support for physicists and
students
**Engineering help and
support**

Pakistan High Energy Physics Network

NCP
Focal point for Physics
Grid Node Tier – 2 data centre
Detector maintenance and support
Detector R&D

HEC
Support for universities
Bandwidth needed through
PERN2