

Current challenges and opportunities in ICAL



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Active detector elements (RPCs)

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- Long-term stability
- Timing requirement
- Electrode characterisation
- Electrode coating, curing, measurement, lamination
- Spacers, buttons, nozzles
- Glue selection, characteristics, cost
- Pick-up panels, technical considerations, cost
- Jig/technique for chamber assembly
- Tooling, procedures for assembly line
- Support structure
- Overall chamber design, slot design
- Optimisation of production procedures
- Industrial production, testing procedures, QC standards
- Transportation – no mean job!
- RPC handling trolley
- Scheme/procedure for RPC installation, maintenance, in-situ repairs
- Device level simulations – basic physics, RPC characteristics, aging, gas chemistry
- Streamer mode operation!
- Multi-gap/timing RPC
- Medical, security applications
- Milking the cow called *BigStack*!
- Offer that you can not miss – operation and data analysis of a *true* ICAL prototype detector at VECC
- R&D for future candidate detectors for ICAL

Electronics and DAQ

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- Signal pickup, termination
- Front-end PA + disc. ASIC, characterisation, studies with RPC detector
- Timing devices, FPGA based?
- RPC DAQ board
- Trigger schemes
 - Triggered: Geographical considerations, scheme, flexibility, programmability
 - Trigger-less: Rates, data volume, technological issues, Software based event selection
- Data transfer schemes, devices, protocols
- Back-end: Standard, board-level designs
- Data concentrator scheme, boards
- Slow control and monitoring sub-systems
 - Magnet
 - Gas system
- Ambient parameters (T, P, RH), corrections, calibration
- Cabling, distribution
- HV/DC generation, supply, control and monitoring, DC-HVDC
- GNDing, shielding, RF/EMI problems – Very very important
- Self diagnosis schemes and techniques

Gas systems

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- Requirement for ICAL, cost
- Open flow systems
 - Pre-mixed
 - On-line
- Recycling systems
 - Open-loop
 - Closed-loop
 - RGA, GC analysis
 - Disposal scheme (RF plasma?) of SF₆
- Volume changes/day, cascading of RPCs
- Studies on gas flow uniformity in RPC
- Safety, environmental concerns
- Emergency shutdown procedures
- New gas mixtures for RPC
- Design of gas system, distribution, control and monitoring for ICAL

Magnet

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- Source of iron, specifications, tolerances
- Machining and finishing!
- Batch testing, characterisation, B-H curve
- Tooling and construction procedures
- Copper coil design, cooling schemes
- Simulation studies of ICAL magnet
- Field uniformity requirement from simulation studies
- Million Rupee prize for devising a technique for in-situ field measurement!

Power

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- Power requirements
- UPS, captive power
- Supply and distribution schemes
- Earth pit, specifications
- Power dissipation, cooling schemes

On-line software and tools

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- System configuration, .xml
- GUI panels for all the tasks – events, monitor, calibration
- Data quality monitors – Data spying
- Watch-dog and alarm systems – email, SMS
- Emergency shutdown procedures
- Data formatting standards, DSTs
- Data analysis tools
- Web based services, tools
- Interaction facilities for collaboration: VC, TC, etc.
- Tools for taking remote shifts