Micromegas milestone issues

Tasks list

Milestones (12.04.2012)

- M1: Validation of the detector resolution for inclined tracks
  - The goal is to demonstrate that the required position resolution (~100 um/layer) can be achieved for inclined tracks (incident angle approx 10 - 30 deg). Tests should be performed with Micromegas detectors having the same parameters as the proposed detector for NSW. These parameters include drift gap size (~5 mm), strip width (~0.5 mm) and gas composition (Ar + CO2 93%+7%). The tests may be initially done with small chambers, in which case it should also be demonstrated that similar performance is obtained with medium size (as big as possible, ~1m^2) detectors.
  - It is important to study the resolution (and other signal characteristics) for different strip length in order to extrapolate the expected performance of full size chambers. Therefore tests with both small and mid size (with strips of as long as possible; ~1 m) chambers is necessary. Comparison with analog simulation is strongly recommended. It will provide valuable information for understanding the observed dependence (or no-dependence) on the strip length, representing a strong argument for adequacy (or non-adequacy) of MM for large size tracking chambers.
  - The mTPC scheme may be studied by a beam test using the new FE prototype chip which will be commissioned soon. Even if the FE chip is not available in time for some reason, an alternative solution should be found and the test of the mTPC scheme be performed. The goal is to obtain a proof of principle of the mTPC method for the NSW MM.H6 test beam periods in 2012
- M2: Realization of full size detector (~2m x 1m)
  - Demonstrate that full size detectors can be built, and that it works as expected. Performance should be equivalent to that of the existing smaller size chambers in terms of important parameters such as gas gain, its uniformity, efficiency and HV-Current behavior. The construction method of these chambers should be such that can be adopted for an industrial mass production.
- M3: Possible damages by sparks with large ionization
  - Accelerated test using for example alpha source in the gas. Such test should be done with several different gas flow rates. In addition to stability of performance over time, inspection of the surface of electrodes should also be done .
- C1: Geometrical accuracy and alignment scenarios
  - Strip accuracy over full size PC board required for precision tracking (~20 um). Here this means that each strip position should be known with ~20 um RMS.
  - Proof of principle of achieving relative alignment accuracy within a module (4 layers)
- C2 : Effects of magnetic field
  - Possible effects of magnetic field should be tested experimentally. A simulation study using a software such as GARFIELD is also necessary. The goal is to demonstrate that the effects of magnetic field are understood and that they are manageable.

Task list – milestones I

- Spatial resolution (µTPC)
  - H6 test beam in July and October
    - Data analysis
  - Performance in magnetic field
    - Simulation (G. Iakovidis)
    - Data: how and where ?
- Trigger principle
  - Simulation (G. Iakovidis)
  - H6 test beam in July and October
    - Online data processing (FPGA demonstrator)
    - CAM, FPGA, …. Implementation study
    - Offline data analysis

Task list – milestones II

- Ageing through sparks (CEA Saclay?)
  - When and how?
- Geometrical accuracy & alignment (CEA Saclay?, Frascati?)
  - Study of mechanical properties of large-area boards
  - Assembly & alignment of layers into multilayer and chamber
- Large area detectors (1 x 2 m^2) (CERN++)
  - PCBs (CERN + industry)
  - Detector housing mechanics (CERN ++)
  - Testing with cosmics

Task list – reporting

- Industrialization
  - Resistive-strip deposition process
  - Mesh options ?
  - Design and production of detector housing (mechanics)
- Trigger & integration of MM and TGC trigger processing
  - Contact to TGCs
- Alignment
  - Alignment coordination (Brandeis, Saclay?)
- NSW layout
  - Layout responsible
- Long-term ageing tests
  - 'Ageing' coordinator
- MM performance under radiation background
  - ATLAS data (MBT0 and SW) – requires data analysis