3x1x1 internal review meeting

25-09-2017

list questions:

1- Do we understand the LAr level? What has been learned about the operation of the level meters and the LAr level assessment w.r.t. the LEM and grid geometry? What should we do better in the 6x6x6?

2- What do we know about the LAr purity? Do we have some analysis of data taken? Is the purity achieved compatible with the requirements of the 6x6x6? Are the purity monitors ready for the 6x6x6 and tested?

3- Is the operation of the PMT behind the HV cathode safe and stable? Is there a different performance between the positive and negative biasing? What is the foreseen baseline for the 6x6x6?

4- Has the operation of the field cage, cathode and the HV feedthrough reached the nominal performance and stability? How much beyond nominal voltage did you operate?

5- Did the DAQ, trigger and DCS reveal some unexpected problems or performance issues?

6- Operation and performance of the CRP:

a) Which problems of the extraction grid were experienced? Which tests were done to assess the problems? Findings?
b) How the planarity of the grid with respect to the liquid level and field cage is known and controlled? Does this have an impact on the electron extraction?
c) LEM performance. What is the maximum gain reached and why? How much is the active area and what is the response uniformity (border effect)? Results of the dedicated test on LEM (also) stand alone performance?
d) Performance of the 2D projective anode (charge sharing, total input capacitance, signal shape, uniformity, …)
e) CRP observed planarity and positioning system performance.

7- Performance of the front end electronics

8- Did we learn something on the ion space charge effect?

Proposed list of actions:

For the 3x1x1:

1) Test the stand alone LEM and Anode in liquid (Grid floating), possible findings: problems of connections, short circuits at 35-40 KV/cm. Precautions should be taken to avoid discharges at the level of the external 10kV feedthrough of the grid.
2) Change the HV power supply, in order to find out why the voltage signals were noisy. Problems with the DCS?
3) With the aim of curing the observed short circuits, operate the motors to raise the CRP and/or, if possible, reduce LAr level (the second option has never been tested before and has to be carefully planned with the cryogenic experts because it could potentially affect the LAr purity). With the LEM in the vapour phase, if the short between the LEM bottom and the grid disappeared, test the maximum applicable voltage across the LEM electrodes. Try to disentangle issues coming from the grid, for instance biasing the LEM in reverse mode. Perform HV tests also on the LEM+anode system. Perform tests that can be compares with those of CEA.
4) If the short is not gone, test the LEM and anode system like done in liquid (grid floating, raise the voltage on the LEM).
5) CRP motorization test Check the feedback loop of the motors on the LAr level sensors.
6) Try to increase the exposition time of the camera placed just below, to spot sparks). For calibration purposes, measure the Grid-LEM capacitance and the level meter when completely in gas.
7) Disconnect the slow control and measure the noise. Disconnect one by one all possible sources of noise to identify and measure all noise contributions (to be done before empting).

When ready to empty:

8) Try to find a solution to insert a cryo-camera. Use a spare hole close to the Nord-face and move up the CRP. If the camera works, look for loose wires and sparks. Try the same with the PMTs (lowering the gain).
9) If the above does not work try with an endoscope.

Laura Molina to prepare a detailed schedule of all this
After the findings organize a new meeting
The message for the cryogenics is that around beginning of November we start warming up. The racks at that moment can be moved to the 6x6x6.

For the 6x6x6:

1) Pause the production of the second CRP LEMs. Negotiate with the firm.
2) Prepare the modified LEM design.
3) Understand the possibility of repairing the present LEM and Grid (e.g., glue to extend the dead area around the spacers, glue and/or ground shield of the biasing cable reaching the liquid).
4) Set up a list of people who defines the cold box test in all details. Present a schedule and a cost figure for it.
5) Submit the modified LEM design for a test.
6) Redo the simulations for the modified design.

a. Full characterization of the mutual capacitance of the anode readout.

7) Ask RD51 to polish one LEM and compare its performance with the one of the non-polished LEMs.
8) Try to understand the possibility of a new grid design, constructed by a Swiss firm (as proposed by Giomataris) and following the RD51 experience.
9) Perform the testing protocol at SACLAY with new LEMs.

Once this is the execution phase, organize a meeting to understand what will be done, might be this meeting can be the same as the meeting for the 3x1x1.