Technical Review of NEXT-100 & Discussions for NEXT-1000

Goals & Agenda

Dates: 4-6 December 2012 (6 December is ½ day)

Location: FNAL
December 4 in Black Hole (WH2W)
5 in One East (WH1E)
6 in Racetrack (WH7X)

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Four Goals:

1. This meeting is intended to offer FNAL and ANL scientific and engineering personnel an opportunity to review technical details of the design approaches, accomplishments, milestones, major subsystems, for NEXT-100 in an informal format. All unresolved issues shall be carefully identified for discussion. Estimates of component and subsystem costs when available shall be presented. However, only a limited amount of relevant technical material will be available beforehand, so that complete familiarization will not be possible prior to the meeting. Accordingly, this meeting will not be a formal engineering review.

2. The role of NEXT-100 in the context of current world effort for neutrino-less double beta-decay searches will be addressed, with attention given to R&D activities that would be essential for a ton-scale system to follow NEXT-100, with sensitivity to WIMP dark matter as well. Attention to this latter possibility will be interwoven during the NEXT-100 review, and will also be the focus of the last part of the meeting.

3. As the informal review proceeds, an associated and important purpose is to identify areas of interest for collaborative involvement in NEXT-100 by ANL and FNAL groups. This will likely mean redistribution of certain areas of responsibility. The status of an FWP, under construction, commissioning, and initial operation for NEXT-100, will be reviewed in some detail, and modifications incorporated as needed.

4. R&D activities that could support a "NEXT-1000" system design will be identified, and at least tentative decisions about specific activities will be sought, including for the currently speculative but plausible directionality concept.

4 December:

9:00 **NEXT-100 Design Status & Issues Overview**

1. NEXT-100 general design and performance goals – JJ (15min)
    a. Canfranc Laboratory infrastructure – Igor (5 min)
    b. Budget, schedule cost – instant overview – Igor (10 min)
2. Mechanics – Derek (90 min)
    a. Pressure vessel
    b. Copper liner
    c. Energy plane mechanics
    d. Energy plane, cables, and feed-through design
    e. Field cage & insulator
    f. HV feed-through
    g. EL planes
    h. Tracking plane mechanics
    i. Tracking plane, cables, and feed-through design

11:00 Coffee break – 30 minutes
11:30 Meeting resumes

3. Electronics (60 min)
    a. Tracking plane electronics – Curro, Azriel,
    b. FNAL SiPM electronic concept – Paul R
    c. Energy plane electronics – Curro, Azriel
    d. Monitoring/slow control – Dave
    e. Discussion

12:30 Break for lunch till 1:30pm

4. Calibrations – John H (30 min, including discussion)
    a. Calibration of tracking plane
        i. SiPM gain stability
        ii. SiPM sensitivity
    b. Calibration of energy plane
        i. Electronic stability/gain
        ii. Electroluminescent conversion stability
        iii. Conversion from ADC units to energy
    c. Discussion
5. Gas system – Igor (30 min)
    a. Regular operation
    b. Flow pattern in detector
    c. Normal and emergency recovery
    d. Leak sensing and mitigation
6. Radiopurity campaign & backgrounds – JJ (30 min)

3:00pm Coffee Break – 30 minutes
3:30pm Meeting resumes

7. Integration TBD (20 min)
    a. Sub-system and system electro-mechanical assembly in Canfranc – Igor, Derek
    b. Commissioning and Testing *in situ*
8. Environmental and safety issues – TBD (10 min)

4:00 – 6:00pm: Discussion - all

1. Capture of unresolved issues
2. Cost issues - Igor
    a. Estimates of missing resources
    b. Contingency plans
    c. European and US contexts
3. Schedule - JJ
4. FWP proposal – Dave
5. Can NEXT-100 run with molecular additives?
6. Priorities - JJ, Dave, Adam
7. Adjustment of agenda focus for Wednesday, as needed

6:00pm: End of session

Dinner at the Para's

5 December

Morning: 9:00 – 10:30

Re-examination of items flagged in first day as issues – likely candidates are:

1. What are the cost-funding gaps?
2. Can any meaningful schedule be prepared now?
3. Tracking plane electronics concepts - choices
4. Tracking plane feed-through issues
5. SiPM daughter board and tracking plane integration
6. Other TPC-like prototypes?
7. Which elements need genuine end-to-end tests?
8. Do we understand the DEMO and DBDM data adequately?
9. What is minimum useful system to install, commission and operate?
10. Gas system flow patterns inside TPC active volume
11. Will EL plane meshes tolerate sparks?
    a. How to test for that?
    b. What to do if the mesh planes need to be more robust?
    c. Radio-pure acoustic monitors inside TPC to sense corona, sparks?

10:30 – 11:00 Coffee break
11:00 – 12:15 Strategic issues

1. Review of directionality idea – uncertainties and opportunities - Dave
2. Review of G2 proposal (we still don't know about DOE decisions) - Dave

3. Discussion of responsibilities within NEXT-100 – JJ, Adam, Rich, Dave, Azriel

4. Review of FWP structure – changes reflecting previous discussion - Dave
12:15 Break for lunch – Chez Leon?

2pm Meeting resumes: (120 minutes)

"NEXT-1000" SWOT: strengths, weaknesses, opportunities , threats, …
DM and BBDK – ton-scale issues
Polish colleagues – discussion of new site?
R&D status and challenges?
Other potential collaborators? – Japan, Poland?
Socialization campaign?

4pm: Coffee break
Clarification of new roles and responsibilities, as appropriate
Identification of missing effort and resources
Approach to DOE, time scale for FWP
Further capture of issues and priorities

6:00 Session ends

6 December, morning session only

I still leave this ½ day open for the moment. My experience is that there will be a number of issues that we will identify during Tuesday/Wednesday, which will need our collective attention on Thursday to bring the meeting to a successful and coherent outcome.

It will be valuable for all to have reviewed the recent NEXT-related R&D posts:

see arXiv:1211.4474 [physics.ins-det] (2012)
see arXiv:1211.4508 [physics.ins-det] (2012)