ATLAS: Kazunori Hanagaki [kazunori.hanagaki@kek.jp](mailto:kazunori.hanagaki@kek.jp)

The scientific point:

   The main purpose consists of two parts, the testing

of the pixel sensor (and ASIC) for the ATLAS upgrade,

and the testing of the SOI monolithic pixel sensor

which is developed by the KEK team.

   The testing of the ATLAS pixel may be carried out

in CERN because ATLAS/CMS people have some

regular beam time at SPS. But we definitely prefer to have

the beam time at Fermilab for various reasons.

For example, sometime the beam time is not enough

because many teams do the testing at the same time

(many parasites).

   On the other hand, it's a serious problem for the SOI.

Since no plans exist except for the Fermilab testbeam,

the development will be delayed significantly. The testing

at Fermilab is really crucial. We had really good result with

the testing at the beginning of this year.

The political or technical view:

   I got the US-Japan funding this year as well as the last

year. Our program of the testbeam at Fermilab is supported

by this. If we don't have a beam time, I can't spend this

budget, which is bad... This is the similar problem I had

when your septum got the problem and no beam. I want

to avoid that we don't have any result although we have

a funding specific for this purpose.

sPHENIX: John Haggerty [haggerty@bnl.gov](mailto:haggerty@bnl.gov) and Eric Mannel [mannel@bnl.gov](mailto:mannel@bnl.gov)

T-1044 has so far had three runs for testing electromagnetic and

hadronic calorimeter prototypes designed for the proposed sPHENIX

experiment at RHIC. sPHENIX received CD-0 approval from the DOE

Office of Nuclear Physics in September, 2016, and is preparing for a

CD-1 review likely to be sometime in FY2018. The design of the

detector is quite advanced, with much of the mechanical and electrical

engineering nearing completion. Results of the previous beam test has

been submitted for publication and is on the arXiv:

https://arxiv.org/abs/1704.01461.

The need for additional beam testing in FY2018 is to do a final test

of the calorimeters which incorporate all changes made to respond

to the experience of the previous beam tests, engineering designs, and

value engineering meant to keep construction costs to the minimum, along

with testing the new digitizer readout system designed for sPHENIX.

The changes to the electromagnetic calorimeter is more careful

attention to uniformity of fibers, improved light collection and light

guides, and the final design of the mechanical support of the towers.

The hadronic calorimeters (there are two longitudinal sections, one

designed to go within a superconducting solenoid, and one outside the

magnet which serves as the flux return) would use the final design of

the scintillating tiles which are the detector element and are now

being manufactured at Uniplast in Russia. The Inner HCAL absorber has

been modified to use flat instead of tapered plates to reduce the cost

of machined stainless steel.

The front end electronics has also been evaluated using test beam data

taken in the previous runs. Based on the results of the studies, the

electronics design has been refined to improve the noise performance of

the analog section. In addition, the LED calibration system has been

redesigned to give an improved LED calibration pulse. The next run of T-1044

will also allow for first test of the new digitizer system being developed

for the sPHENIX calorimeters. The new digitizer system consists of a 64

channel digitizer board based on a 14-Bit ADC operating at 60 MHz and

capable of providing up to 31 time samples of the optical signals at a

15 kHz trigger rate.

To summarize, the main need for one final beam test at FTBF is to

confirm that the final design of all three calorimeter sections

perform as expected in simulation before the upcoming CD-1 and CD-2

reviews, and provide an archive of beam test data in a variety of

beams and energies that will characterize the detector. sPHENIX is

expected to be the flagship experiment at RHIC after it begins

operation in 2022, and has been supported for advanced engineering and

design in the President's FY2018 budget request for the Office of

Nuclear Physics.

CMS HGCal: Roger Rusack [rusack@umn.edu](mailto:rusack@umn.edu) and James Freeman [freeman@fnal.gov](mailto:freeman@fnal.gov)

Our ideas are now a little clearer than they were two weeks ago. First of all we have just learnt that DUNE is requesting a significant amount time in the beam at CERN where we will run this year, making it unlikely that we will get more than a week’s worth of beam in 2018 before the long shutdown.

As Jim said we are considering bringing over the whole 5 integration lengths of our calorimeter installing in December and taking data in the New Year.   We cannot commit to this now as it is a major use of our resources and it needs to be agreed  to by the collaboration. It would, on the other hand be very good for our program to have the tests done as soon as possible as they inform other parts of the program.

In addition to the test of the calorimeter, there are many smaller scale tests that we need to make and getting them done sooner rather than later would really help the program. In particular investigating precision timing with our detectors - like we did last year, but with real modules.  There are many more detailed tests that we would do with beams for example: we could investigate different module assembly techniques; test different ranges of our electronics and investigate beam effects on ASICs.  These tests can be done with just a few of our modules, not the full 112 modules.

So overall we are interested in beam time for the CMS high granularity calorimeter this year.  Specifically time January and several periods spread over the available time.

The consequences to us of having the beam for the project will be to help advance the project rather than prevent delay.  It might, but we cannot say that ahead of time. We need to learn a lot about our calorimeter and having test beam time really will enable us to explore solutions that normally we would have to wait until we get beam at CERN, or have to make do with bench tests.

CMS Outer Tracker and Pixel detectors: Lorenzo Uplegger [uplegger@fnal.gov](mailto:uplegger@fnal.gov)

FOR CMS PIXEL PHASE II UPGRADE

Running few months would be unacceptable for us since we will test the devices in November and then irradiate them and then test them back in April after irradiation.

Our program for scenario 2 would not make any sense since we would not be able to test the devices after irradiation (which is what is really interesting) so it wouldn’t even make sense to test before irradiation. The devices we are testing are pixel sensors for the CMS phase II upgrade and finally this year we’ll have a readout chip that can handle the 10^16 new/cm^2 which is close to the dose that the inner layer of the pixel detector will absorb during phase II, proving finally that today’s devices can or cannot handle those doses. If the devices fails then we’ll need to rethink the design which might delay the construction of the detector

Scenario 1 instead would be more acceptable since we can eventually reduce the number of devices to be tested but also try to be more efficient when taking data (for example increasing the intensity, or if they only have 50% of the shifts install during the night and take data during the day).

FOR OUTER TRACKER PAHSE II UPGRADE

Also in this case scenario 2 would be likely unacceptable unless we are lucky and the accelerator is up when we need to take data. The Outer tracker testbeams are distributed between CERN and Fermilab and the location is decided by the lack of beam in the other location. In winter in fact we are planning to have a testbeam here since there will not be beam at CERN.

This year it is important for the Outer tracker since the new and “final” readout chip the CBC3 that corrects some of the bugs that were present in the CBC2. Testing them this year is crucial because in the next 2 years the module production will start and any bug discovered in the chip might also delay the construction of the outer tracker detector.

Again, scenario 1 can be mitigated by better efficiency during the data taking.

NOvA Test Beam: Alexandre Sousa <alex.sousa@uc.edu>

We briefly discussed the impact on NOvA Test Beam during the Executive Committee meeting at the end of the NOvA Collaboration meeting about 9 days ago.

First off, the impact of reduced running for the Main Injector on the overall NOvA science milestones is extremely severe, and there will be a pre-PAC presentation this week by Mark Messier that will illustrate that point.

Regarding test beam proper, not being able to run next year would have the following undesirable consequences I can foresee:

1) We may have no beam during Spring 2018 to test and tune the new MCenter tertiary beam line

2) Reduced running in late 2018 and Spring 2019 will affect commissioning of detector and beam line. 3 months of operation is probably enough to accumulate the data we need, so reduced running by 50% would probably be okay. However, we were already contemplating running only 3 months because of sharing beam with the gaseous TPC effort. If we have to reduce our 2019 running down to 1.5 months, that will likely be insufficient for our needs.

3) If the whole FTBF schedule is moved by one year as a consequence of reduced running, so that the NOvA test beam effort cannot happen in late 2018, spring 2019, we will lose our window of opportunity to have the maximum impact on NOvA physics, the more important of which is the potential measurement of the neutrino mass hierarchy at more than 3 sigma, which we would expect to reach in 2022-2023. The test beam would significantly reduce systematic uncertainties in the response of protons, pions, and electrons to 2-3% from the current 5-6%, thus improving the sensitivity of all the analyses being carried out. It could also have very significant impact on cross-checking our simulations and developing new reconstruction and PID algorithms.

4) If we have to move the effort to 2020, we will still do so, as the Collaboration is very keen in using any information the test beam can provide, but it will also mean the test beam data may only impact NOvA’s later analyses, when worldwide competition may have already caught up.

Impact on Gaseous TPCs: Jennifer L Raaf <jlraaf@fnal.gov>

For gaseous TPC, I think I would still be ok with reduced running — I don’t need enormous statistics, just enough running to do particle ID studies, and possibly a pion cross section measurement for comparison with LAr.  If only next year is planned for reduced running, I might consider reversing the order of my tests — put the GArTPC in the neutrino beam first, and then in the test beam.