SC-2 questions/requests

DEC-12-2017

Q1) We would like to hear about planned modifications to booster. In particular

* the status of the design of the injection girder.
* The effect on the booster lattice of lengthening the straight.
* Anticipate current limit
* RF upgrade

Answer:

1. Talk about Booster upgrades will be presented day 2 of SC-2 breakout session. Answer to these questions are on the slides.

Q2) We heard today that CW capability has already been addressed for some linac systems. But it is not clear what is required regarding CW to satisfy the project goals. What defines success? And then what is the cost of the piecemeal demonstration of CW capability? What are the implications for the beam dump? For machine protection systems?

Answer:

1. The PIP-II Linac is a 800-MeV superconducting linac, constructed of CW-capable components, operated initially in pulsed mode

* Accompanied by modifications to Booster, (Recycler, Main Injector) to accommodate higher injection energy and higher beam intensities
* CDR parameters: “operated initially in pulsed mode" 20 Hz, 2 mA, 550 microseconds necessary to support the LBNF/DUNE neutrino program

1. CW capable: hardware capable of running CW beam
2. PIP2IT Mission Statement: The PIP-II Injector Test (PIP2IT) facility replicates the front end of the PIP-II linac through the first SSR1 cryomodule. **PIP2IT is intended to serve as a complete systems test that will reduce technical risks associated with the PIP-II linac in both pulsed and CW operating modes.**

* **Phase 1: retirement of risks associated with operation of the PIP-II linac in pulsed mode as required for neutrino operations and described in the CDR (1% duty factor).**
* Phase 2 (not part of project):
  + retirement of risks associated with CW operations, in particular as related to utilization of the PIP-II linac for a second generation Mu2e experiment

1. In PIP2IT the goal is to achieve required beam characteristics from the ion source through the SSR1 cryomodule operated at 2 mA, 20 Hz, 550 msec. In addition, perform RF-cryomodule testing at CW and pulse mode
2. There is no piecemeal demonstration. Linac systems are CW-compatible from the beginning. There is no intention to implement a full-power CW-capable beam dump. The CDR beam dump (50 kW) is capable to accommodate the "CDR beam" (17 kW) as well as tuning scenarios expected for CW operation. MPS being designed to be CW capable. MPS is being tested at PIP2IT.

Q3) Is the project responsible for spares? What spares are in the budget?

Answer:

1. Spares are addressed in the Assumptions Document, pip2-docdb #144. In Section 3 Scope Assumptions:

*The PIP-II project will fabricate an adequate complement of spare components to achieve all threshold KPPs and supporting objective KPPs. Such spares will be included in the Project cost.*

*In consultation with Accelerator Division, the Project will identify and fabricate an initial complement of spare components adequate to sustain operations. Such spares will be fabricated by the Project and then will be transferred to, and reimbursed from, the Fermilab special process spares account prior to CD-4[SDH1].*

1. The project followed the guidance from OPA – ( <https://science.energy.gov/~/media/opa/pdf/processes-and-procedures/1702_Spares_FPD_Forum.pdf>).
2. At this point, there are spares necessary for commissioning (e.g., electronics boards) and for not meet specifications, (e.g. 9 cavities where 8 are need), but not spare components (e.g., cryomodule).

Q4) Is there outstanding accelerator physics R&D to be done before writing a TDR?

Answer: No.

Q5) Electron cloud in recycler and/or MI. Is this known to be a non problem? Is it a risk with some cost? Are there additional tests that could be done to mitigate the risks?

Answer:

1. PIP II does not address any beam dynamics issues in MI/RR (or Booster). We do not need to provide 1.2 MW for the CD-4, we just need to have the capability to accelerate the intensity required. That is why we do not include any beam dynamics risks. We do not anticipate any issues in MI and for the Recycler we anticipate that the beam scrubbing now we have a new vacuum system will be more effective and we will have no issues. We do plan to do beam studies with increased intensity.