Commissioning Scenario

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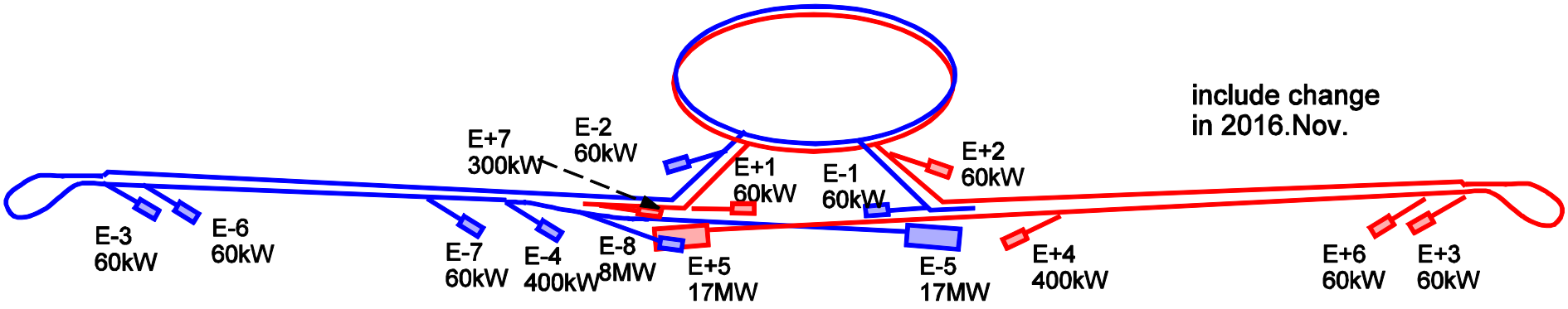
Commissioning Timeline in TDR

- Commissioning for one year after completion of the entire system
- Then, data taking starts with the luminosity, which should build up to the full value in 4 years
- This does not seem to be realistic, but we have anyways to shorten the commissioning time as far as possible

What's been Decided

- First stage 250GeV center-of-mass
- The tunnel is kamaboko-style through out the main linac and BDS regions
- The shielding wall between the accelerator and service tunnel is 1.5m thick
  - Rigorously, electron side BDS tunnel has not been decided
- Specification of the beam dumps has been redefined by the Change Request 13

Beam Dump Distribution



Assumptions

- Tunnel excavation of the entire site will be completed almost simultaneously, though TDR says (v3 part2 p.244)
  - Excavation of access tunnel starts at year 1.0
  - DR commissioning can start at year 7.5
  - ML commissioning can start at year 9.0

  This does not seem to be realistic.
- Commissioning starts after installation of all the big components
- Consider both undulator and e-driven systems for positron production
- Auxiliary positron source is absent for the undulator scheme
- For e-driven system, the positron line tunnel is shared with BDS (not in an independent tunnel)
- Perhaps, there should be movable shield near the region of the muon wall (~300m from IP) to protect the IR region during weak beam commissioning

Electron Source

- Assume (perhaps) no work is being done in the BDS accelerator tunnel
- Weak beam
  - much lower rep rate
  - Full intensity pulse is perhaps OK
- Use dump E-1
- Can start electron DR commissioning

Electron DR

- Start with the weak beam from the electron source
- Full intensity (0.5A) is possible
  - But not 5Hz extraction
  - To accumulate the beam is possible even if the pulse from electron source is not full
- Possible to
  - Scrabbing
  - injection/extraction kickers
  - low emittance
- Use beam dump E-2

Electron RTML (not incl. BC)

- Do not expect intensity effects
- Use beam dump E-3

Positron Source

- e-Driven
  - Same as electron source
  - Use beam dump E+1 (and additional dump at the end of the electron driver)
  - Up to full intensity pulse (but lower rep rate)
- Undulator
  - must wait for the weak beam commissioning of the electron main linac
  - Use tune-up dump E-4 for waste electron
  - Use photon dump E+7 and positron dump E+1
- Do we need PPS zone boundary between the end of ML and positron production region?

Electron Main Linac (incl. BC)

- RF commissioning can start earlier
  - Can enter the service tunnel
- Weak beam commissioning
  - Access to BDS region is not possible???
    - Must design PPS!!
  - Access to detector hall requires shielding at the muon wall
  - Detectors can be at garage position
  - Use beam dump E-6 (BC), E-7, E-4 up to 400kW
- Undulator scheme
  - Go through undulator (off), positron target not in position
  - Must reach 125GeV for starting positron source commissioning

Positron Main Linac

- e-driven
  - Same as electron ML
- Undulator
  - Commission process is the same but must wait for the positron DR & RTML commissioning

BDS (both beams)

- Open the shield at the muon wall
- One of the detectors must roll in
- Single bunch essentially enough
- Use main beam dump E-5 / E+5
- Beam tuning
  - Position tuning of each beam

Final System Tuning

- One of the detectors must sit at IP
- Weak to full beam tuning of the whole system
  - Before this stage, sources, DRs, and RTMLs have already been commissioned to full pulse intensity (though low rep rate). New areas to be tuned to full intensity is ML and BDS.
- Use main beam dump E-5 / E+5

Some Keys

- We know human access to the ML service tunnel is not allowed during beam operation but is allowed during RF test. What about the case when the beam is “weak”?
- We have to define PPS zones.
  - Between ML and BDS?
  - At the position of muon wall?

A PPS Design needs to define zone boundaries and gates that

- Satisfy radiation control during commissioning and operation in both beam and service areas.
- Satisfy access controls during operation and maintenance.
- Design sub-zones to make access and/or search functions as efficient as possible.
- Allow for transport of replacement equipment.
- Allow emergency egress for personnel.
- Be consistent with ventilation of tunnels in both normal and emergency conditions.

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- The last 3 items could also be a headache!

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Strawman Schedule using Only Undulator E+ Source

ELECTRON BEAM STAGES

WEEKS

(1) E- Injector thru booster end at 5 GeV ……..4

(2) Transport to E- DR INJ thru energy compressor ……..2

(3) E- DR to DR- Extraction ……..8

(4) E- Extraction thru RTML to Compressors Linac start ……2

(5) E- Bunch Compressor to E- Linac End ……..3

(6) E- Thru Undulator to BDS E- dump. ……..2

(7) BDS Dump thru IR, detector to Main E- Dump ……..6

POSITRON BEAM STAGES Starting in parallel with 7)

(8) E+ Source to (missing dump)? after booster. ……..6

(9) E+ Transport to E+ DR Injection thru energy compressor and spin rotator....2

(10) E+ DR to DR Extraction ……7

(11) E- Extraction thru RTML to Compressors at Linac start. ……..2

(12) E+ Compressors to Linac End and BDS E+ dump ……..4

(13) BDS dump thru the IR, detector to Main E+ Dump ……..4

(14) Collide Beams and Tune all systems with beams to main dumps. ……?

52+ WEEKS