

ASD UPDATE: COMMISSIONING

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U.S. DEPARTMENT OF
ENERGY

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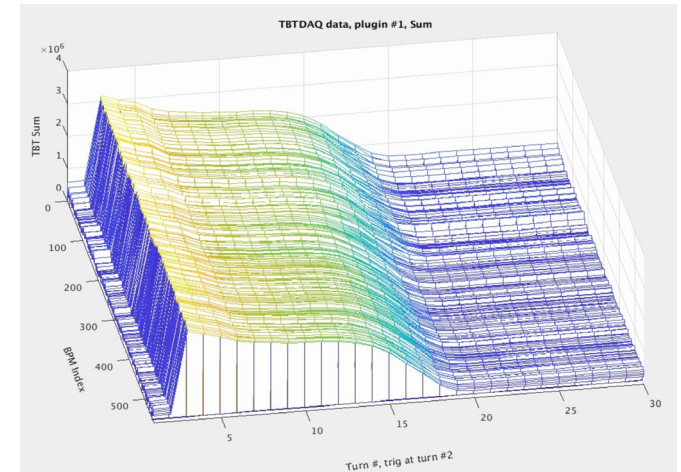
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APS

SR COMMISSIONING STARTED ON APRIL 10

Major milestones:

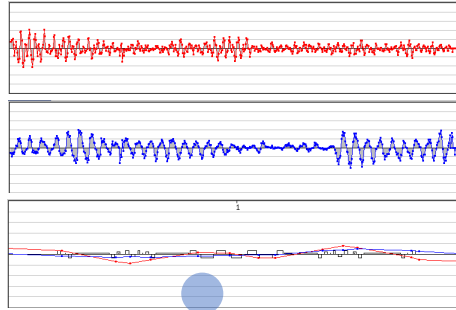
- Completion of first turn – shows no major problems with vacuum system
- Stored beam – shows no major problems with magnets
- First multi-bunch swap-out operation – world's first
- 25 mA stored beam – allows to start beamline commissioning



APS-U COMMISSIONING –TIMELINE

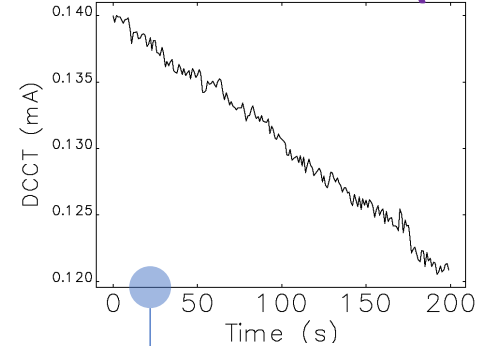


First turns



April 13

Stored beam (0.15mA)



April 20

ARR

Pre-starts

DOE
review

Machine
studies

Radiation
studies

Machine
studies

Future : Lattice corrections, multi-bunch SWAP-OUT, Vacuum conditioning

March 25-29

April 8

April 10

April 18

April 23

DOE Authorizes
Start of commissioning

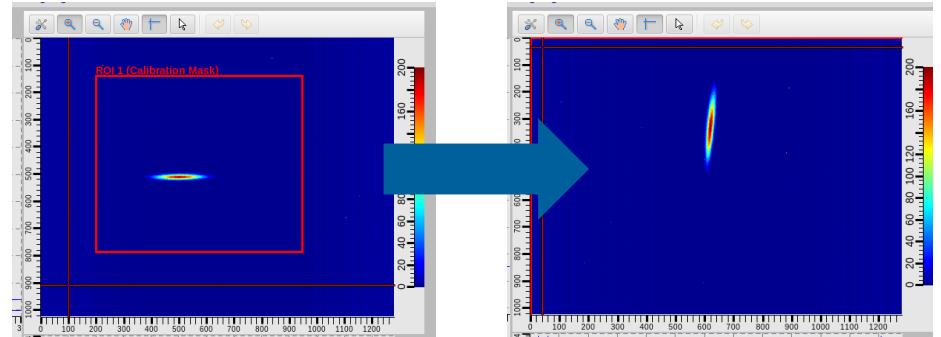
Most of the experiment
floor is open

BTS* UTILIZES EMITTANCE EXCHANGE

First use of emittance exchange in light sources

- Entrance into the storage ring is a known bottleneck – it is only 2.8-mm wide
- To squeeze the beam through, we utilize horizontal to vertical emittance exchange

Emittance exchange in BTS

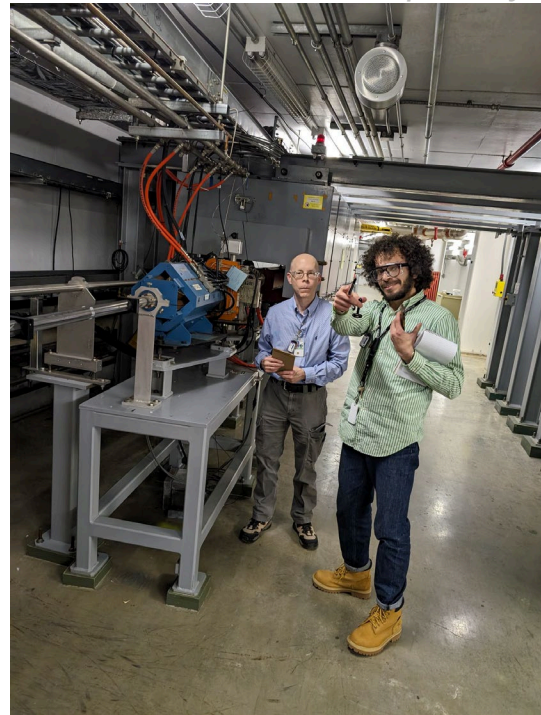


*BTS – Booster To Storage ring transfer line

POSITRONS STILL HAUNT US

- It took 36 hours to determine that BTS lattice was wrong
 - Tunnel access revealed 5 BTS quadrupoles were connected with opposite polarity
- BTS lattice reuses 5 old APS quadrupoles designed for positrons
 - When these quadrupoles were connected to new power supplies, they were connected the "positron way"

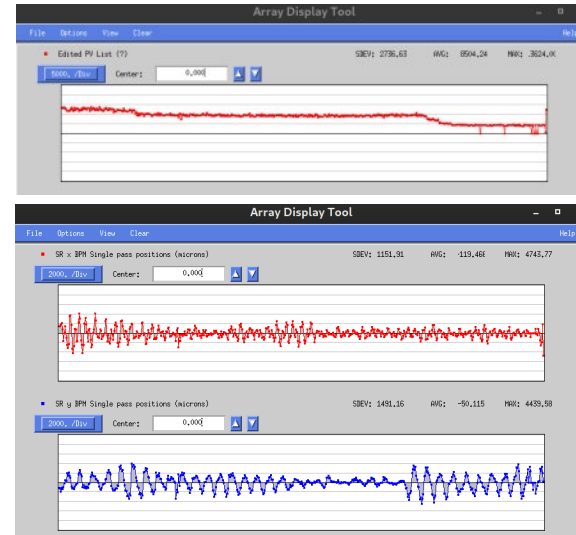
Tunnel access to check polarity



FIRST TURN – 4/13

Well-aligned machine resulted in quick first turn

- After adjusting injection conditions, the beam went all the way to S28
- Adjustment of correctors in storage ring brought the beam all the way to the end of turn one!!!
- Further corrector adjustment resulted in 100% transmission through first turn



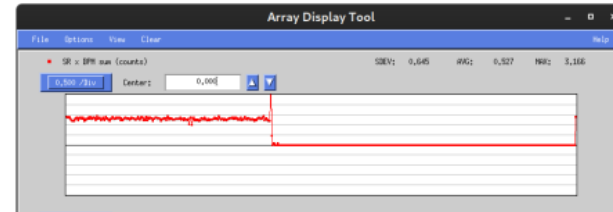
BPM sum signal (560 BPMs showing beam intensity)

Horizontal and vertical trajectory on first turn

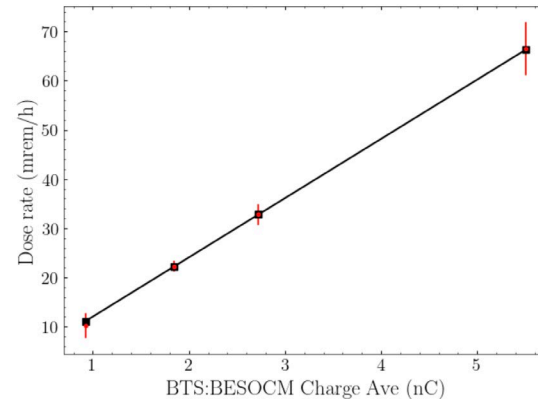
EARLY SHIELDING VALIDATION TO ALLOW ACCESS TO EXPERIMENT FLOOR

Done in close coordination between Physics and Radiation groups

- Twenty scenarios were chosen to represent typical locations of beam losses
 - Septum, beam dumps, IDs...
- Injected beam is sent directly into the loss location



Sharp beam loss at intended location

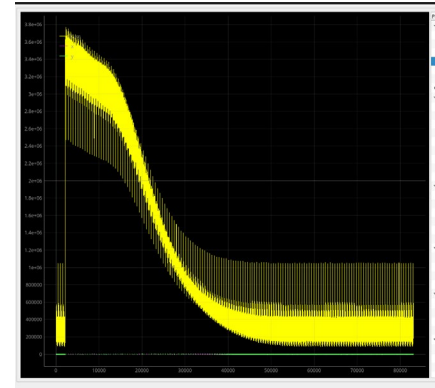


Dose rate on a sensor outside of the loss location as a function of supplied charge

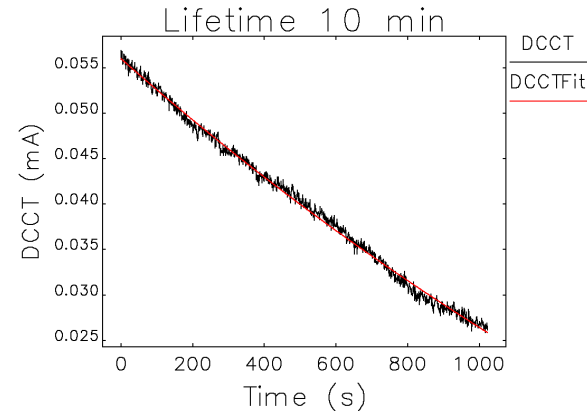
STORED BEAM WAS ACHIEVED ON APRIL 20

- First step – achieving multi-turn transmission without sextupoles
 - Was hard, required strange large orbit at the septum location
- Second step – ramping sextupoles while correcting multi-turn trajectory

First stored beam captured at 90% sextupole strength



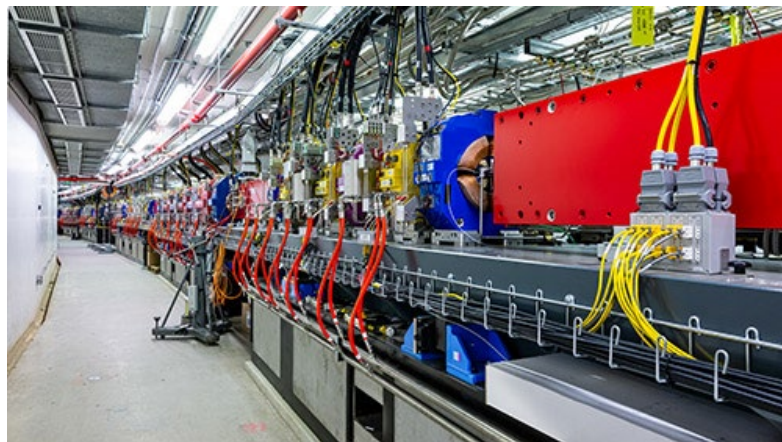
Beam intensity over several dozens of turns without sextupoles



COMMISSIONING IS GOING AS PLANNED

Detailed plan contains 40 tasks, we are on task 7

- Next major steps:
 - Establishing swap-out and multi-bunch operation to increase stored current to 10 mA
 - Like top-up, swap-out will be the world's first
 - Vacuum conditioning and ramping current to 25 mA to proceed to beamline commissioning



COMMISSIONING IS A COMBINED EFFORT OF A LARGE TEAM OF PHYSICISTS, ENGINEERS, AND TECHNICIANS

- When commissioning such a complex machine, complications are expected
 - Our physics team and technical groups are well equipped for solving such problems
- Early commissioning results point to a well aligned and well assembled machine
- Commissioning is on schedule

