



U.S. DEPARTMENT OF
ENERGY

Office of
Science



AIP and Large Projects

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OPS 2015 StayTreat

Accelerator Improvement Projects

Accelerator Improvement Projects (AIP):

- Large greater than \$500k projects
 - Can span multiple years
- Assigned a special B&R code, but more or less funded by moving funds from Accel OPS B&R into AIP account.
- Tracked at a high level (DOE), included in the annual budget briefing and S&T reviews.
- Must be an improvement, not maintenance.
 - C50 program is not an AIP project.
 - High power dump maintenance is not an AIP project.

AIP FY13-FY15

AIP work completed FY15

Dogleg Upgrade -- Restores CEBAF path length adjustment to pre-12GeV upgrade range. FY13-FY15



AIP work completed FY14

Injector Upgrade (R100) – Install, commission and operate R100, 100MeV capable cryomodule, effectively doubling the Injector energy gain for compatibility with 12GeV CEBAF.

AIP work completed FY13

Injector Upgrade (Gun portion) – Install 200keV capable DC gun, operate for physics at 130keV FY12-FY13

AIP

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Dogleg Upgrade	925	639						
Full Energy Injector – 1/4 Cryomodule	375	540	444					
Full Energy Injector – Integration			759	877	645	127		
C50 RF Power & Controls				350	607	725	733	796
Global Timing System						225	280	283
6D Beam Diagnostics						200	250	250

AIP work planned for FY15 – FY19

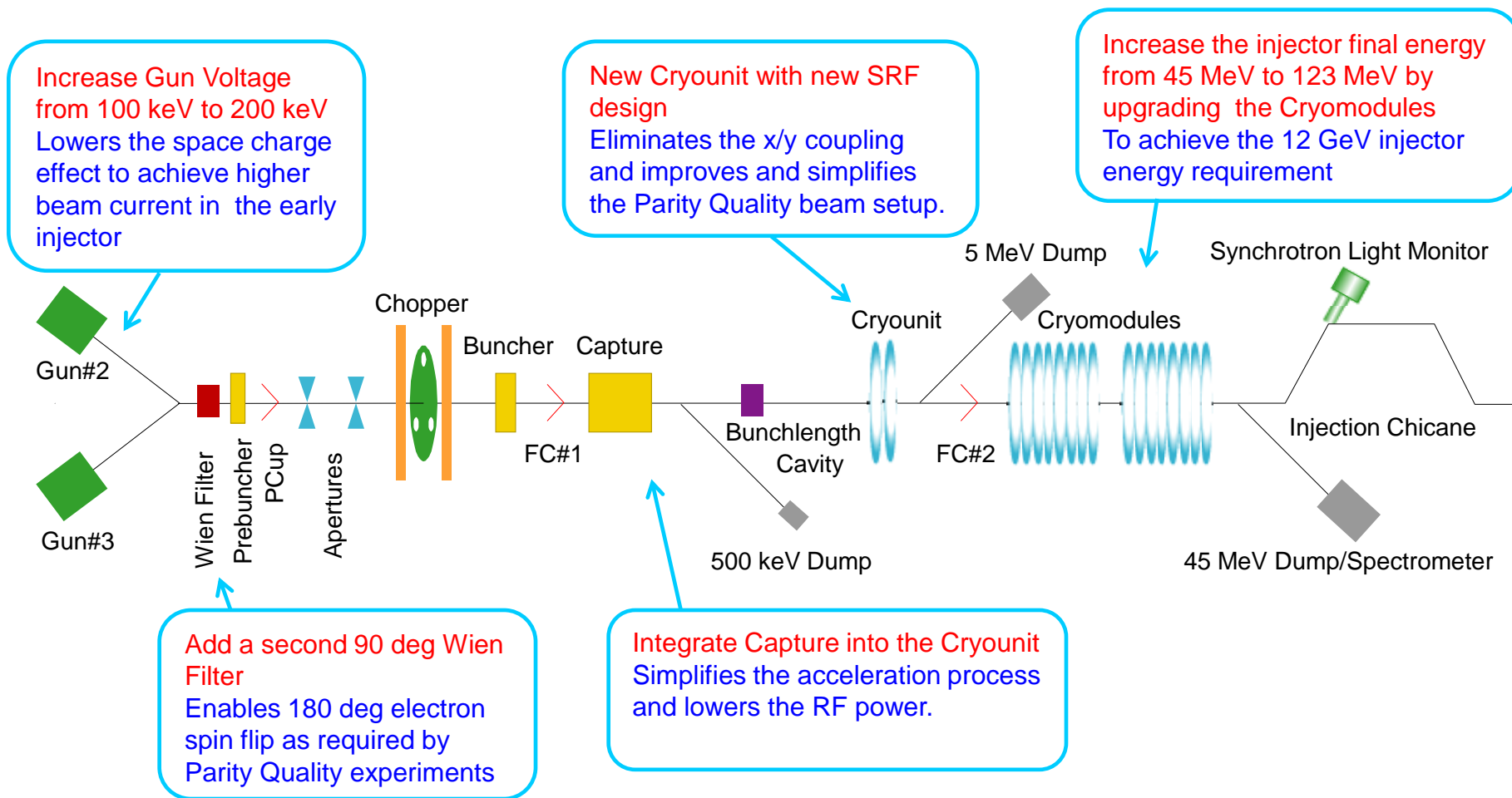
Injector Upgrade – Upgrade the CEBAF Injector for 12GeV parity program.

Build ¼ Cryomodule – Establish uncoupled transport in the injector. FY11-FY16

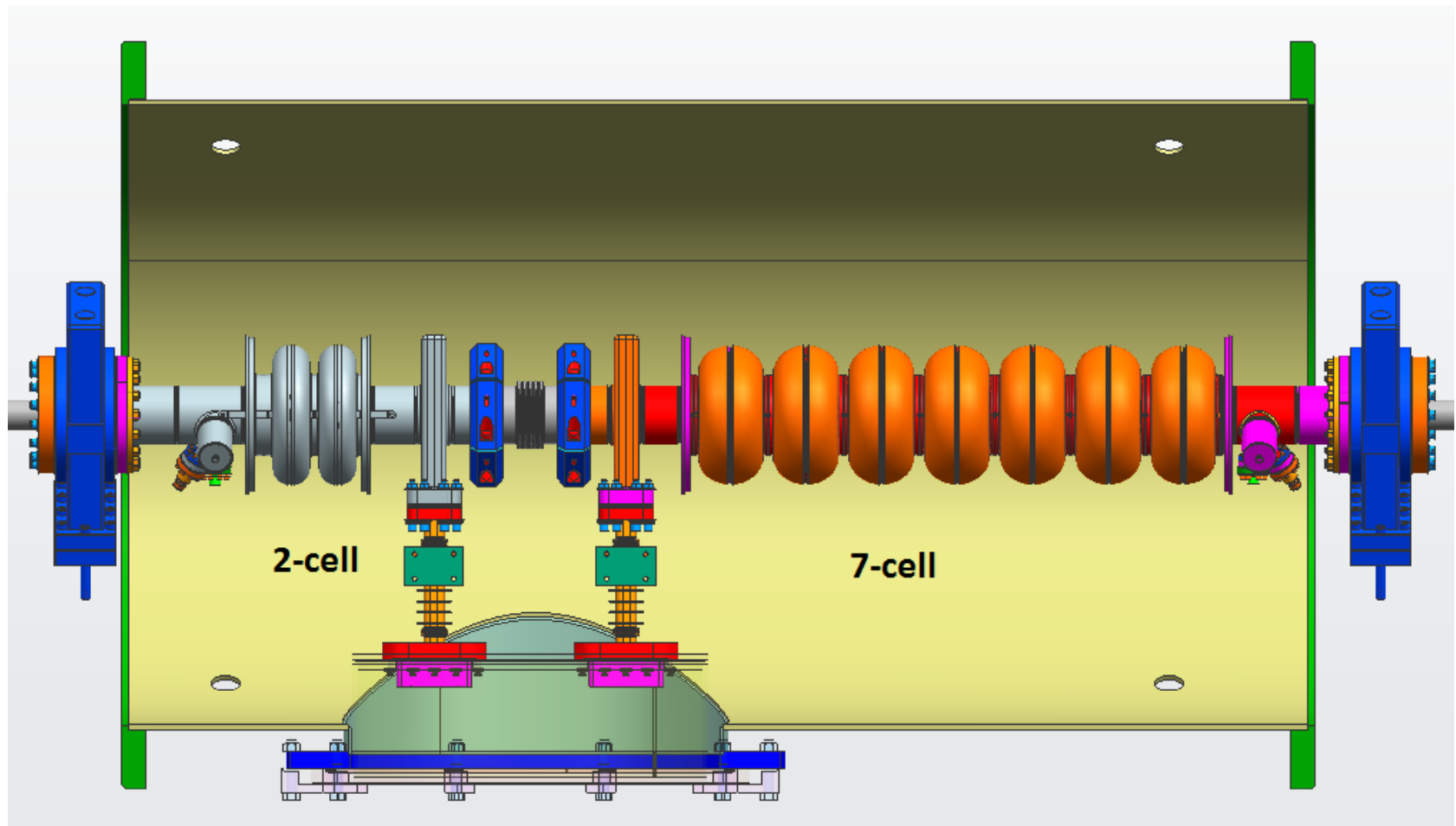
Integration – Commission the new ¼ cryomodule in the Upgrade Injector Test Facility (UITF). Upgrade CEBAF Injector components in the warm RF region to support 200keV operation.

Install the commissioned new ¼ cryomodule. Commission the complete upgraded injector, from the 200keV gun operation through the new ¼ cryomodule and R100. FY15-FY19

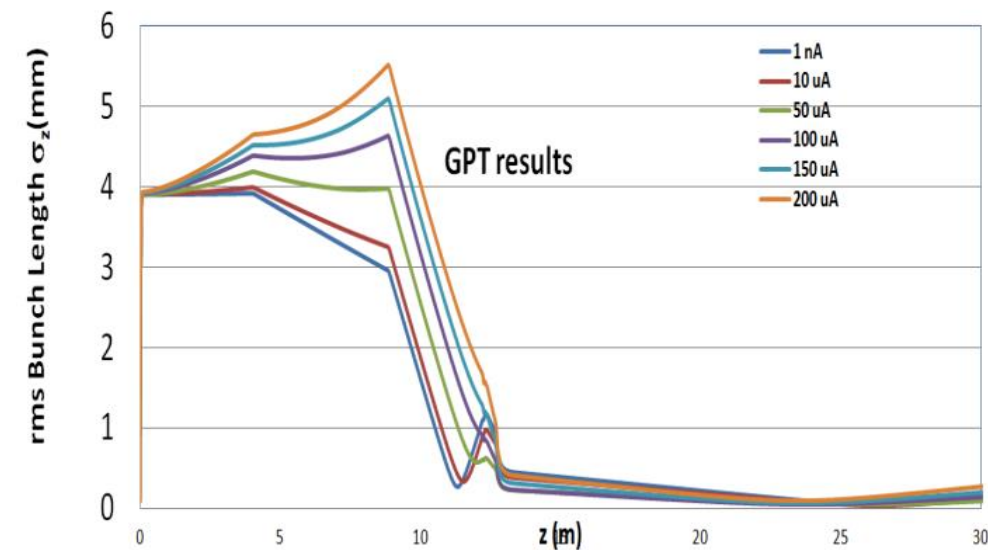
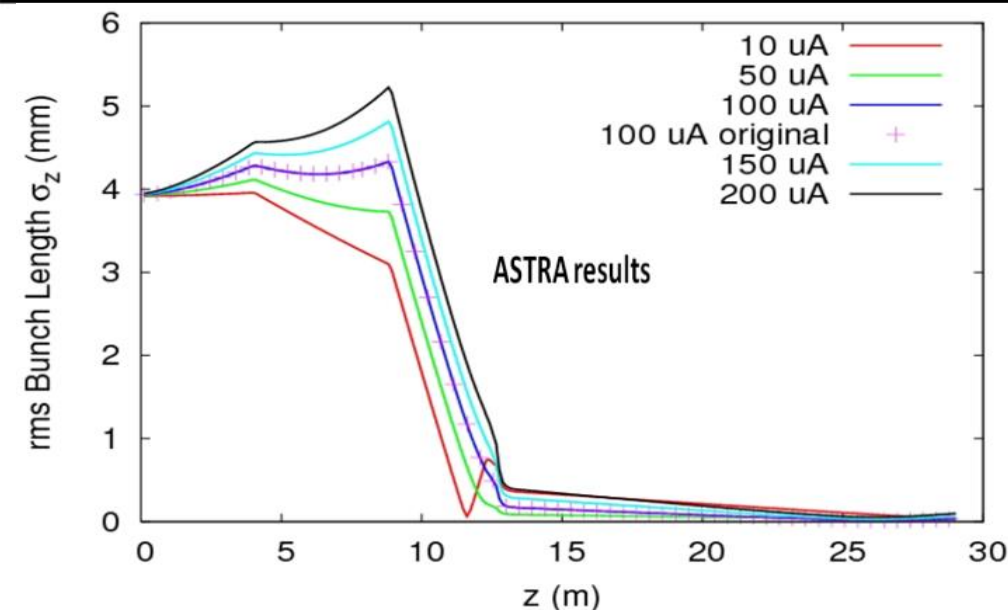
The goals of the CEBAF Injector upgrade



The New Booster



Results – checked with two codes



- Bunch length for different currents. This accelerator has to work for both low and high beam currents at the same time!
- The currents are for 499Mhz CW beam structure.

Injector Upgrade

- New $\frac{1}{4}$ cryomodule will be ready for initial testing in FY16
 - Commission at the UITF
 - Cavities complete
 - Cryomodule design nearly complete, procurements started.
- Need a upgrade team and project leader/manager to manage the many aspects of this upgrade:
 - Gun 200kV operation
 - Upgrade warm RF section for 200keV transport
 - Commissioning new $\frac{1}{4}$ cryomodule in UITF (FY16/FY17)
 - CEBAF installation and commissioning FY18 and FY 19

AIP Beyond Injector Upgrade

C50 RF Controls upgrade:

- Digital upgrade of the C50 zones, probably about one per year.
- AIP Funding starts in FY17.
- Use RSR funds to start preliminary design and cost estimates in FY16.

Global Timing System:

- Epics synchronous timing system
- AIP funding projected to start in FY19
- While waiting for AIP funding, small team should start working on the requirements.
 - Some aspects of this project may already be in progress

Large non-AIP projects

- C50 refurbishment
- Hall-C dump maintenance

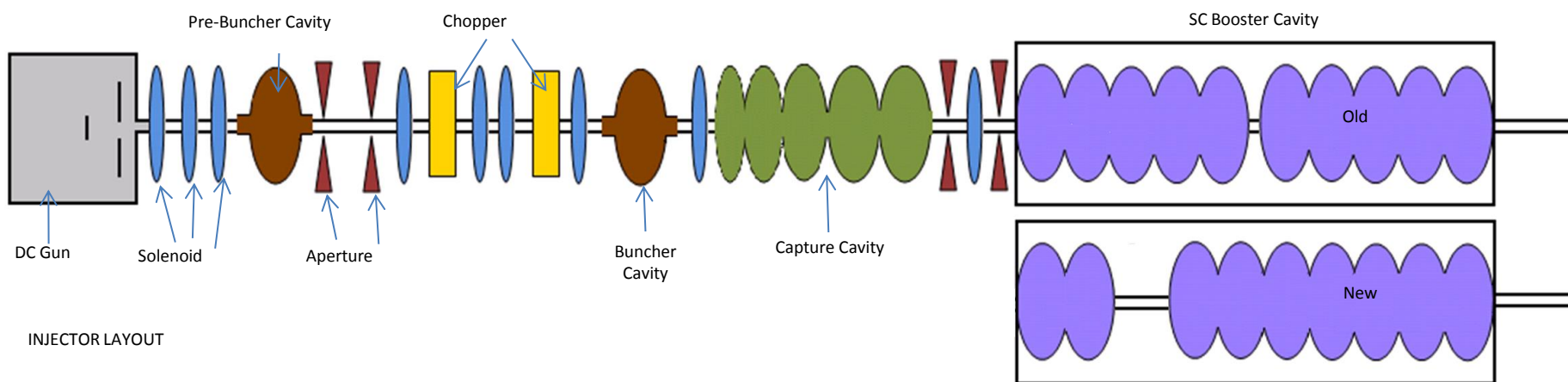
Summary

- Need to attach names/teams to the long term AIP projects.
 - Empowered to work through funding shortfalls.
 - Maintain project momentum
- Project list subject to change
 - C75 project.....

Stop

Simulation and Optimization

- Different designs for the SC Booster was studied. The best results were found with 2+7 quarter design.

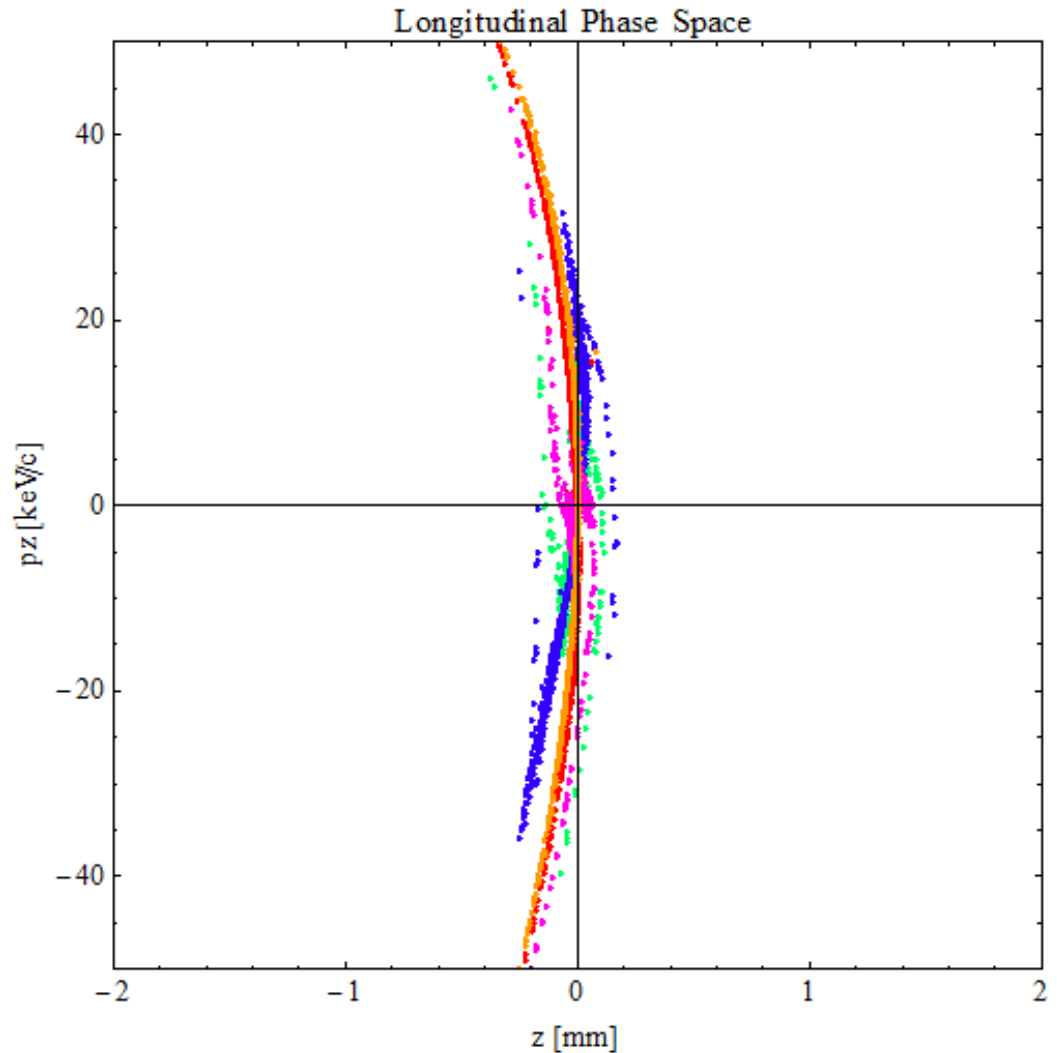


A set point

Energy spread gets large with decreasing current. A result of the over bunching before entering the 2 cell in the unit.

Yellow- Red – Magenta – Green -
Blue

1 - 10 - 50 – 100 – 200uA



Sensitivity

Limits:

Set points chosen randomly
 $\pm 2\%$ around the nominal
condition.

Phase in unit $\pm 5\%$

Range:

Bunch length and transverse
emittance still within budget

Energy spread and mean
energy also reasonable

