

Title	<i>PAR Kicker Upgrade</i>		
Project Requestor	Ju Wang		
Date	04/18/2008		
Group Leader(s)	Ju Wang		
Machine or Sector Manager	Chihyuan Yao		
Category	Obsolescence/ Spares		
Content ID*	APS_1256851	Rev.	3
			5/12/08 3:37 PM

*This row is filled in automatically on check in to ICMS. See Note ¹

Description:

Start Year (FY)	2009	Duration (Yr)	2
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Objectives:

To increase the reliability and serviceability of the PAR kicker magnet systems and to improve the performance by reducing the kicker pulse width. The upgrade and redesign will also greatly reduce time to repair in the event of a failure. Design target of the operation voltage is 35 kV maximum.

Benefit:

Primary benefit is increased reliability, serviceability and reduced downtime due to kicker failure at the operating energy of 325 MeV. Due to the nature of the kicker hardware a failure typically entails a downtime of at least 10 hours for diagnosis and repair. This amount of downtime is among the largest for any critical hardware failure at APS. Redesign would result in increased reliability, decreased time to repair in the event of a failure, and a system that is easier to maintain. The upgrade will allow the PAR to operate up to its design energy of 450 MeV, which will improve the Booster operation since the Booster ramping supplies are better regulated for higher beam energy. Additional benefit includes a cleaner and more stable beam extraction achievable by reducing the pulse width by 10-20% and better matching the waveforms between three kickers.

Risks of Project: See Note ²

None

Consequences of Not Doing Project: See Note ³

There are three consequences of not doing the work:
 1) Continued vulnerability to long injector downtimes (10+hrs) when PFN cables or terminations fail.
 2) Unable to operate for beam energy level higher than 325MeV without significant risk of high voltage failure.
 3) Less satisfactory PAR performance.

Cost/Benefit Analysis: See Note ⁴

Failure of this project will keep the ASP operations at the risk of extended downtime. A typical major failure in a kicker power supply costs for than 10 hours of downtime. This project will reduce the possibility of failures and significantly reduce the repair time should a failure occurs.

Description:

The objectives of this project will be achieved by a redesign of various components of the PAR kicker magnets and associated power supply components for improved reliability, serviceability, and 35kV maximum operation voltage. The pulse forming network (PFN) parameters will be optimized to reduce the pulse width. Components requiring redesign include: PFN cables and connectors for better reliability, faster replacement in the event of a cable failure and better EMI shielding. Redesign of the magnet coils and connections to eliminate use of silicone dielectric compound at the ends of the coils. Additionally the thyatron tanks and lids would be redesigned and the magnet configuration would be studied for improvement in pulse shape. The magnet enclosure will be redesigned for better EMI shielding. Work will be collaboration with the Mechanical group, Operations group and Power Supply group.

The majority of redesign for reliability and maintainability has been completed. We have tested the new design at 35 kV briefly without problems. The remain tasks including completing the long term HV test, completing the PFN cable housing and testing for EMI effect, optimizing the PFN parameters to reduce the pulse width by 10-20%, and constructing three production units.

Funding Details

Cost: (\$K)

Use FY08 dollars.

Cost (\$k)

Year	AIP	Contingency
1	300	10%
2	300	10%
3		
4		
5		
6		
7		
8		
9		

Contingency may be in dollars or percent. Enter figure for total project contingency.

Effort: (FTE)

The effort portion need not be filled out in detail by March 28

Year	Mechanical Engineer	Electrical Engineer	Physicist	Software Engineer	Tech	Designer	Post Doc	Total
1								0
2								0
3								0
4								0
5								0
6								0
7								0
8								0
9								0

Notes:

¹ **ICMS.** Check in first revision to ICMS as a *New Check In*. Subsequent revisions should be checked in as revisions to that document i.e. *Check Out* the previous version and *Check In* the new version. Be sure to complete the *Document Date* field on the check in screen.

² **Risk Assessment.** Advise of the potential impact to the facility or operations that may result as a consequence of performing the proposed activity. Example: If the proposed project is undertaken then other systems impacted by the work include ... (If no assessment is appropriate then enter NA.)

³ **Consequence Assessment.** Advise of the potential consequences to the facility or to operations if the proposal is not executed. Example: If the proposed project is not undertaken then ____ may happen to the facility. (If no assessment is appropriate then enter NA.)

⁴ **Cost Benefit Analysis.** Describe cost efficiencies or value of the risk mitigated by the expenditure. Example: Failure to complete this maintenance project will result in increased total costs to the APS for emergency repairs and this investment of ____ will also result in improved reliability of _____. (If no assessment is appropriate then enter NA.)