Title	***PAR Rf System Upgrade***			
Project Requestor	Michael Borland			
Date	March 21, 2008			
Group Leader(s)	Arnold, Borland, Goeppner, Nassiri			
Machine or Sector Manager	CY Yao			
Category	Accelerator Hardware and ID Improvements			
Content ID*	APS_XXXXXX	Rev.	ICMS_Revision	ICMS Document Date

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

Description:

Start Year (FY)	**2009**	**Duration (Yr)**	**3**

Objectives:

The purpose of this proposal is to improve the reliability, stability, and flexibility of PAR operation. And achieve the original performance goal of the systems. This will be done by upgrading the existing rf systems.

Benefit:

More consistent delivery of bunches to the booster, particularly during top-up operation. Fewer operational issues that interfere with top-up. Improved system stability could also allow us to run the systems with high gap voltage, which should reduce bunch length and improve bunch purity.

Risks of Project: See Note [2]

Low.

Consequences of Not Doing Project: See Note [3]

Continued occasional operations issues that interfere with top-up and make system tuning difficult. Not being able to run the systems in most optimized configuration to produce beam with best quality.

Cost/Benefit Analysis: See Note [4]

Many of the components are moderate in cost and have significant benefit. Hence, cost/benefit is favorable.

Description:

This proposal is discussed in the context of a general PAR improvement initiative in Section 4 of OAG-TN-2008-008.

This proposal has several components:

1. Rf voltage upgrade to the full specified voltages from the PAR design. This will permit running at higher energy (which improves booster capture stability) and/or providing shorter bunches (which improves +/-1 bunch purity).
2. Fast, FPGA-based control loops to improve system stability and shot-to-shot reproducibility. These could take advantage of the new FPGA-based current monitor electronics.
3. PAR rf cavity temperature stabilization using a water regulation system. At present, the temperatures are at the mercy of the air temperature in the tunnel. Using a water system would not only provide superior stability, but also the ability to tune the cavities without mechanical modifications.
4. Replace the inner conductor with a new one with better coating to reduce multipactor effect in the fundamental cavity.
5. Increase harmonic RF drive power and reduce cavity Q to combat beam loading effect.

Funding Details

Cost: ($K)
Use FY08 dollars.

Year	AIP	Contingency
1	110000	
2	100000	
3	34500	
4		
5		
6		
7		
8		
9		
Total	244500	

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	0.05	0.2	0.55			1.3
2	0.1	0.2	0.05	0.2	0.3			0.85
3		0.1	0.1	0.1	0.2			0.5
4								0
5								0
6								0
7								0
8								0
9								0

[1] **Notes:**

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. C*heck Out* the previous version and C*heck 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.)