Title	***SR Lattice Modifications***			
Project Requestor	Michael Borland			
Date	March 21, 2008			
Group Leader(s)	Michael Borland, Katherine Harkay			
Machine or Sector Manager	Louis Emery			
Category	Accelerator R&D			
Content ID*	APS_1255059	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)**	**2**

Objectives:

Perform comprehensive studies of lattice upgrade options, leading to a menu of options with full understanding of the risks, benefits, and difficulty.

Benefit:

Possible reduction in the emittance or provision of long straight sections.

Risks of Project: See Note [2]

None.

Consequences of Not Doing Project: See Note [3]

Benefits not available.

Cost/Benefit Analysis: See Note [4]

Involves staff time and computer resources. Potential payoff is high. Hence, Cost/Benefit is favorable.

Description:

A fuller discussion of this project is in OAG-TN-2008-008, Section 2.

Lattice modifications may be entertained for various reasons, such as higher brightness or longer straight sections. We can perhaps get another 15% improvement in emittance through lattice adjustment, perhaps more if transverse feedback allows reducing the chromaticity. This will be revisited.

We propose to also fully investigate four concepts for further lattice improvement:

1. Use of dipole magnets with longitudinal gradient to lower the emittance, promising emittance as low as 1.8 nm (based on preliminary investigations).
2. Use of pole-face windings to create gradient dipoles and lower the emittance, promising emittance as low as 1.8 nm (based on preliminary investigations).
3. Transverse displacement of quadrupoles to lower the emittance, promising emittance as low as 1.5 nm.
4. Lattice with long straight sections in all sectors. This is the least ambitious concept and may involve increasing the emittance to 3.3 to 3.8 nm (based on preliminary investigations and tolerance for increased beta functions).

Investigations will include studies of working point choice, sextupole tuning, error effects, system tunability, magnet strength and design requirements, and so forth.

Funding Details

Cost: ($K)
Use FY08 dollars.

About 1.5 FTE physicist for 2 years (the entry form doesn't work for me).

Year	AIP	Contingency
1		
2		
3		
4		
5		
6		
7		
8		
9		
Total	0	

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

[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.)