Title	***Storage Ring RF Cavities***			
Project Requestor	Alireza Nassiri, Geoff Waldschmidt, Tim Berenc, Dave Bromberek			
Date	August 21, 2008			
Group Leader(s)	Alireza Nassiri			
Machine or Sector Manager	Louis Emery			
Category	Accelerator R&D			
Content ID*	APS_1269961	Rev.	1	8/21/08

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

Description:

Start Year (FY)	**FY09**	**Duration (Yr)**	**5**

Objectives:

Design studies and prototyping of a third-harmonic Landau cavity for the APS storage ring.

Benefit:

Improve stored beam lifetime which is dominated by large-angle intrabeam scattering known as Touschek effect. Damping coherent instabilities such as LCBI.

Risks of Project: See Note [2]

Medium

Consequences of Not Doing Project: See Note [3]

Lose opportunity to improve and enhance APS storage ring performance.

Cost/Benefit Analysis: See Note [4]

Benefits includes operation of the APS storage ring that 100 mA with full beam stability. Raising the single bunch threshold limit.

Description:

Utilizing a Landau cavity in the APS storage ring will serve to improve beam lifetime. This implies longer time interval for topping-up, thus reducing disturbances to x-ray. In addition, a 3rd harmonic cavity has other benefits. When the phase of the harmonic voltage is adjusted such that the bunch lengthens, it caused an increase in the spread of synchrotron frequencies within the bunch. This spread is helpful in damping coherent instabilities such as longitudinal coupled bunch instabilities through Landau damping. A decrease in peak current and synchrotron tune spread is also helpful in raising the threshold for single bunch current instabilities. Additionally, the phase of the harmonic voltage can be adjusted such that the bunch is shortened. This cavity can be run in a passive mode by detuning the cavity as far as possible from harmonic 3h.
The scope of this work consists of:

1. Phase I: Design, development, and prototyping of a 1056 MHz (3rd harmonic) single-cell normal conducting copper cavity.
   This cavity may be installed in SR and operated in passive mode.
   Duration of phase I work: Y1, Y2
2. Phase II: Design, development, and prototyping of a 1056 MHz (3rd harmonic single cell superconducting cavity.
   Duration of phase II work: Y3,Y4

Funding Details

Cost: ($K)
Use FY08 dollars.

Strategic Project Proposal
Funding Details
FY 08 $

Cost ($k)

Year	AIP	Contingency
1	170	
2	220	
3	200	
4	200	
5		
6		
7		
8		
9		
Total	790	

Contingency may be in

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	0.25	0.15	0				0.6
2	0.2	0.25	0	0.1				0.55
3	0.25	0.4	0	0				0.65
4	0.25	0.4	0	0.1				0.75
5	0	0	0	0				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. 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.)