Title	***Injector synchrotron light monitor upgrade***			
Project Requestor	Bingxin Yang			
Date	02/28/2008			
Group Leader(s)	Glenn Decker			
Machine Manager	C. Y Yao			
Category	Spare / Obsolescence			
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:

(1) Replace obsolete analog video cameras with digital video cameras to cover the wide dynamic range required from injection to extraction of beam from PAR and Booster. (2) Purchase a synchroscan timing plug-in for injector streak camera for single turn measurement capability of bunch lengths and phase. (3) Improve optical resolution to 50 – 70 μm RMS and increase imaging frequency to 1 kHz or higher to visualize the evolution of electron beam sizes during acceleration and damping. (4) Develop single turn capability for reliable measurement of sizes and diagnostics for transverse instabilities.

Benefit:

Higher dynamic range using digital video solve spare camera problem and increases the dynamic range. High-resolution diagnostics capabilities allow better diagnostics and visualization of instabilities in the PAR and Booster. Better resolution in beam size measurement help development of smaller beams in the Booster, which improves injection efficiency and reduces beam losses in the storage ring.

Risks of Project: See Note [2]

None. The new systems will be implemented in steps to supplement / replace the existing emittance monitor.

Consequences of Not Doing Project: See Note [3]

Without good diagnostics many standard beam tuning and modeling techniques can not be applied effectively. Poor resolution makes it difficult to diagnose instabilities in the injector rings. Some analog cameras currently in use are no longer manufactured and

spares are hard to find. New model substitute cameras are not identical with the old cameras and resulting down time and create support problems.

Cost/Benefit Analysis: See Note [4]

High spatial resolution will be obtained with minor upgrade to the imaging optics. Digital video camera will be mainly responsible for the improvement in dynamic range and imaging speed / frequency. Single turn phase / bunch length measurement will be obtained by purchasing an appropriate synchroscan unit with phase stabilization unit.

These technologies are tested and are adequate for the upgrade proposed here.

Description:

This minor upgrade include the following components:

(1) Digital video replaces obsolete analog cameras. It is mainly responsible for the improvement in dynamic range and imaging speed / frequency.
(2) A minor optics upgrade will be used to improve spatial resolution.
(3) Single-turn phase / bunch length measurement will be obtained by purchasing a low-frequency synchroscan unit with phase stabilization unit, and by installing a low jitter timing system.
(4) Single-turn transverse beam size measurement will be developed, based on gated cameras at hand or on fast linear APD arrays.

Funding Details

Cost: ($K)
Use FY08 dollars.

Year	AIP	Contingency
1	50	10%
2	50	10%
3	50	10%
4		
5		
6		
7		
8		
9		
Total	150	15

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	0.1		0.1	0.1	0.1	0.25		0.65
2	0.1		0.1	0.1	0.1	0.25		0.65
3	0.1		0.1	0.1	0.1	0.25		0.65
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.)