Title	***Insertion Device Vacuum Chamber R&D***			
Project Requestor	Greg Wiemerslage			
Date	3/21/08			
Group Leader(s)	P. DenHartog			
Machine or Sector Manager	Rod Gerig			
Category	Accelerator R&D			
Content ID*	APS_1254430	Rev.	2	3/21/08 3:17 PM

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

Description:

Start Year (FY)	**2009**	**Duration (Yr)**	**5**

Objectives:

Conduct R&D on vacuum chambers for specialized insertion devices for synchrotrons. ERLs, and FELs.

Benefit:

New developments in insertion devices at APS and for APS upgrades such as an ERL and FEL require novel designs for vacuum chambers. This project will allow the APS to continue its history of leading the development of insertion device vacuum chambers.

Risks of Project: See Note [2]

NA at this phase.

Consequences of Not Doing Project: See Note [3]

If the proposed project is not undertaken APS will loose its dominance in this field and the performance of new insertion devices will likely suffer. A continuing effort at ID VC R&D is necessary to maintain APS capabilities.

Cost/Benefit Analysis: See Note [4]

The additional performance achieved by an insertion device with an optimally designed vacuum chamber easily justifies a continuing R&D effort in this area.

Description:

The performance of x-ray beamlines is closely coupled to the performance of insertion devices. A number of considerations in the design of undulators, such as a desire for high brilliance and a large tuning range, drive the design of the vacuum chamber to small gaps. On the other hand, particle beam transport considerations require the largest possible aperture. The competing requirements demand a vacuum chamber design with a minimum chamber wall thickness, close tolerances for straightness and flatness to enable precision alignment, and mechanical and thermal stability. R&D on vacuum chambers is necessary to achieve these goals. Specialized insertion devices (IDs) often demand additional features, such as aperture smoothness, in order to accommodate individual geometries.

This project will build upon the success with 0.5 mm wall thickness chambers developed for the LCLS and apply the technology to chambers for APS. Prototypes will be machined that can allow up to 1 mm smaller undulator aperture without sacrificing electron beam aperture. In addition, R&D on aperture polishing will continue for application to future accelerators. Tests will be also be performed and prototypes will be constructed in conjunction with ID R&D in order to optimize performance for particular research programs.

Funding Details

Cost: ($K)
Use FY08 dollars.

Year	AIP	Contingency
1	100	
2	100	
3	100	
4	100	
5	100	
6		
7		
8		
9		
Total	500	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

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

Effort (FTE)

Year	Mechanical Engineer	Electrical Engineer	Physicist	Software Engineer	Tech	Designer	Post Doc	Total
1	0.2				0.2	0.1		0.5
2	0.2				0.2	0.1		0.5
3	0.2				0.2	0.1		0.5
4	0.2				0.2	0.1		0.5
5	0.2				0.2	0.1		0.5
6								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.)