

Title	<i>RF Beam Position Monitoring and Feedback</i>			
Project Requestor	Glenn Decker			
Date	May 15, 2008			
Group Leader(s)	Glenn Decker			
Machine or Sector Manager	Louis Emery			
Category	Beam Stability			
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)	FY08	Duration (Yr)	5
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Objectives:

- Monopulse beam position monitor upgrade (APS_1255203)
- Storage ring real-time feedback upgrade (APS_1255207)
- Fast steering corrector relocation (APS_1255209)
- Spurious storage ring vacuum chamber microwave mode dampers (APS_1255205)

Benefit:

Improved AC and DC beam stability, at the level of 220 nanoradians rms 0.016 – 200 Hz, 500 nanoradians p-p for one week.

Risks of Project: See Note ²

Slight risk of sporadic elevated beam motion during the commissioning phase. These efforts must be closely coordinated with a parallel upgrade to the storage ring power supply systems. The usual risks associated with vacuum intervention will accompany the effort to damp chamber microwave modes, this will result in periods of somewhat degraded lifetime during machine startup, which will be overcome with top-up operation.

Consequences of Not Doing Project: See Note ³

Certain components of the beam position monitoring and feedback systems suffer from obsolescence concerns, specifically with regard to viable spare parts. AC beam stability is now limited by the decade-old fast feedback hardware to 50 Hz closed-loop bandwidth, while a lot of residual noise extends up to 200 Hz, which will be addressed by the new hardware.

Cost/Benefit Analysis: See Note ⁴

It is expected that beam stability will improve at least a factor of two in most measures when all upgrades are completed. This proposal will benefit AC stability and obsolescence the most, and will improve our ability to diagnose unscheduled beam loss events, improving availability. It will cost \$1.7M.

Description:

- Upgrade data acquisition for broadband (monopulse) and narrowband rf beam position monitors with modern hardware.
- Add processing power to the realtime feedback system in order to increase sample rate from 1.5 to 20 kHz, improving closed-loop bandwidth from 50 to 200 Hz.
- Increase the number of fast correctors available to the realtime feedback system to allow better AC correction capability.
- Eliminate spurious microwave modes affecting 80 vacuum chambers / 160 vertical beam position monitor readbacks.

Details can be found in the above-referenced sub-proposals.

Funding Details

Cost: (\$K)

Use FY08 dollars.

Year	AIP	Contingency
1	525	34
2	510	40
3	546	41
4	50	5
5	50	5
6		
7		
8		
9		
Total	1681	125

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

APS Strategic Planning Proposal

Year	Mechanical Engineer	Electrical Engineer	Physicist	Software Engineer	Tech	Designer	Post Doc	Total
1	0.65	0.9	0.12	0.3	1.27			3.24
2		0.75	0.1	0.3	2.7			3.85
3		0.55	0.1	0.5	2.65			3.8
4		0.1		0.3	1.1			1.5
5					1			1
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. *Check Out* the previous version and *Check 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.)