Title	***State-of-the-art Phase Noise/Jitter Measurement Instrument (SPX)***			
Project Requestor	Frank Lenkszus			
Date	3/20/08			
Group Leader(s)	Ned Arnold			
Machine or Sector Manager				
Category	X-ray Science Enablers			
Content ID*	APS_1255513	Rev.	2	3/20/08 12:00 AM

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

Description:

Start Year (FY)	**FY09**	**Duration (Yr)**	**1 year**

Objectives:

Acquire a phase noise/timing jitter measurement instrument suitable for making low phase noise/timing jitter measurements to support state-of-the -art timing and phase reference generation/distribution

Benefit:

Time resolved experiments and upgrades such as SPX and ERL require low timing jitter phase references. The APS currently has no instrument that is specifically designed to make jitter measurements in the sub 100 femtosecond range. Our current equipment limits our measurements to around the picosecond range RMS. The SPX project and ERL upgrade both have demanding requirements for timing jitter and phase noise. We need instrumentation capable of measuring the performance of systems under development and to be developed for these projects. Time resolved experiments will also benefit through the development of more stable timing references such as laser RF references.

Risks of Project: See Note [2]

Consequences of Not Doing Project: See Note [3]

The lack of suitable measurement equipment makes it difficult if not impossible to implement low phase noise/timing jitter references for beam-lines and upgrades such as SPX and ERL. Without such equipment we will be seriously hampered in any design effort requiring sub picosecond timing jitter. And if such a system is implemented without the subject equipment we will lack the ability to verify performance or diagnose performance problems. For example, the instrument we now use to measure timing jitter has a specified jitter of greater than 1 picosecond. This makes attempts to do

subpicosecond jitter measurements and development vitually impossible. Other labs doing precision timing and phase reference development possess the proposed instrument and often publish performance results measured with that instrument.

Cost/Benefit Analysis: See Note [4]

It is virtually impossible to do state-of-art timing development for beam-lines or upgrades such as SPX and ERL without suitable diagnostic equipment. Stable low jitter timing and phase references are essential to upgrades such as SPX and ERL Lack of such equipment will make it impossible for us to test and characterize timing and phase reference systems to the required precision.

Description:

Under this proposal a phase noise measurement instrument such as the Agilent E5052 with the optional jitter measurement software will be acquired.

Funding Details

Cost: ($K)
Use FY08 dollars.

Strategic Project Proposal
Funding Details
FY 08 $

Cost ($k)

Year	AIP	Contingency
1	100	10%
2		
3		
4		
5		

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

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.)