Australian Synchrotron Development Plan
Project Submission Form

Section A: Summary and Proponent Details

Project Title

Diagnostic and Development Beamline (DDB)

Spokesperson

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Executive Summary (approx. 100 words)

The primary benefits of constructing a Diagnostic and Development Beamline (DDB) at the Australian Synchrotron can be categorized under three main headings;

- Characterize and monitor the electron beam for user operations
- Provide a platform for accelerator development and optimization
- Provide a platform for developing techniques and concepts for future accelerator and beamline projects and upgrades in areas of science and engineering

Developing a DDB would have immediate benefits as it would enhance in house capabilities of science and engineering staff and also provide a focal point for design collaboration with both national and international universities and facilities.

Once in operation scientific and engineering development will continue by using the DDB to support beamline development in areas such as detectors, high heat load design, optics, shutters and slits etc. With the development of these sorts of projects not only would existing and new beamlines benefit from the newly developed technology but it will also potentially place the science and engineering teams involved in the work at the leading edge of their field.

Other proponents (add more rows if necessary)

Name	Institution	Email address
Greg LeBlanc	AS Accelerator Physics	
Rohan Dowd	AS Accelerator Physics	
Eugene Tan	AS Accelerator Physics	
David Zhu	AS Accelerator Physics	
Elsa van Garderen	AS Accelerator Physics	
Brad Mountford	AS Engineering	

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Section B: Detailed Description

B1: Description of Proposed Beamline/Development Project

It is proposed the DDB be located at SR07ID due to it being a less desirable location for a traditional user beamline for two reasons. Firstly – the straight section in the storage ring is short due to the RF cavities also located in the same straight. This provides constraints which makes the location potentially undesirable for a user beamline. Secondly – the distance from the storage ring ratchet wall and the edge of the experimental floor is at its shortest in this location. This is also unattractive to a user beamline as it will impact on the optical design (and performance) of the beamline.

The DDB project will require hardware development and instrumentation from the storage ring dipole vessel through to the endstation. In the interest of time, cost and manpower, it may prove prudent to purchase a frontend the same as which are currently installed on existing beamlines. This will allow for full development manpower to the actual beamline.

It is expected the optics and mechanical design of the beamline will be done in house and initially it is expected a pre-used DCM and other major hardware items be used. The use of pre-used equipment is not out of the question as this would allow for better equipment to be purchased at a reduced price. The optics will be tailored for electron beam diagnostics.

It is envisaged that the wiggler currently in use on the IM beamline will be used once the superconducting wiggler is installed in its place.

B2: Applications and Potential Outcomes to Australian Scientific Community

The DDB will be used as a diagnostic tool for accelerator performance – for example real time beam diagnostics, low emittance measurements, beam stability and support of future top up operations. It would complement the existing beam diagnostic tools as it would provide specific data relating to straight sections whereas current diagnostics are using bend magnets as their source (optical and X ray beamlines).

As well as being a tool for the accelerator, the DDB will provide a platform for the development of future and existing beamlines. Specifically hardware such as detectors, slits, optics, etc, and also controls development projects such as ‘on the fly’ data acquisition and analysis. These development projects are of interest to both internal scientists and engineers but external groups as well. Therefore there will be significant opportunity to enter collaborative projects with these external groups and other synchrotron facilities.

Projects and technology which are ultimately to be used on the beamlines can be thoroughly tested on the DDB which will bring the impact to the user schedule to virtually nil.

B3: Match to Selection Criteria

The DDB will satisfy three major needs and goals. Firstly it will support accelerator development and user operation by providing specific straight section data not currently available – second, it will provide a platform for the development of new technology and techniques for new and existing beamlines – third, it will provide a focal point for collaborative development projects with national and international teams. This will significantly raise the profile of the Australian Synchrotron.

B4: Potential Users

The potential users for this system would be all of those groups that have indicated a willingness to collaborate with the accelerator science and engineering groups at the Australian Synchrotron. These include the University of Melbourne School of Physics, the Monash University School of Physics, the Australian National University, and ANSTO.