Proposal for TRIUMF Commitment (5YP 2015-2020)

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SuperB Computing Facility

PROPONENT: Randall Sobie **TRIUMF CONTACT:** Chris Hearty

PRINCIPAL COLLABORATORS:

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PROJECT DESCRIPTION:

SuperB is a new project at the Cabibbo Laboratory in Italy and is designed to measure the properties of particles produced in electron-positron collisions starting 2018. The facility will operate at a centre-of-mass energy just above the threshold for producing b-quarks. SuperB will produce 100 times the data of existing B-Factories designed to probe the flavor sector of subatomic physics through precision measurements and searches for rare processes. These measurements will give SuperB sensitivity to new physics at energy scales far beyond the center-of-mass energy of the collider.

SuperB is an international effort involving accelerator and particle physicists from Canada, France, Italy, Norway, Poland, Russia, Spain, U.K., and the U.S. The project is classified as the highest priority project in the National Research Plan of Italy. The Canadian SuperB collaboration involves researchers from Victoria, UBC, Montreal, and McGill. M.Roney (Victoria) is the Principle Investigator of the Canadian group.

The Canadian SuperB group plans to build a near-real-time computing facility with similar functionality to the TRIUMF ATLAS Tier 1 centre. The SuperB Centre will connect to the Cabibbo Laboratory where it will receive some fraction of the raw data within a few hours of it being recorded. The Centre will be able to reprocess it into sets for data analysis. The Centre will also be used for analysis and simulation production.

The aim is to have the SuperB Centre operational 1-2 years prior to first beam in 2018. An application for the funds for the Centre would be submitted to CFI in the next competition. The type of facility is a dedicated, real-time centre and is not a type of facility operated by Compute Canada. The award will include the costs of the hardware, manpower to commission and operational costs such as power. The CFI IOF funds will be used to provide manpower to operate the facility for a five-year period.

SCIENTIFIC JUSTIFICATION:

SuperB will record an unprecedented numbers of B-mesons, charm particles, and tau leptons. This will enable us to search for processes that are forbidden by the Standard Model, but predicted to exist in theories beyond the Standard Model. This data sample also permits us to make measurements with unprecedented precision. By comparing these results with predictions of the Standard Model and theories beyond the Standard Model, we are able to search for new physics.

RELATIONSHIP TO BROADER CANADIAN RESEARCH COMMUNITY:

The accelerator-based program of IPP consists of the frontier-energy physics studying proton-proton collisions with ATLAS at the LHC, neutrinos physics with T2K and precision physics using electron-positron collisions using BaBar. In this decade, both T2K and BaBar are undergoing a transformation to the next-generation experiments while ATLAS will study p-p collisions at even higher energies. SuperB is highlighted as a potential future high priority project in the Canadian Long Range Plan for subatomic physics.

TRIUMF already operates an ATLAS Tier 1 facility and a smaller T2K computing facility. The proposed facility would be similar in scope and scale to the ATLAS Tier 1, providing near-real time access to computing resources. Additional computing resources for simulation and data analysis will be requested from Compute Canada. Currently Compute Canada resources at McGill and UVIC are used for SuperB Monte Carlo simulation.

All these projects are evolving to a common distributed infrastructure known as the World-wide LHC Computing Grid (WLCG). SuperB also uses the WLCG framework for managing and controlling analysis/simulation jobs around the world. It would be cost-effective and logical to form a common approach for managing such computing resources. We have met with representatives of T2K and ATLAS, and both groups were open to further discussion.

The Canadian SuperB team has significant expertise in establishing computing facilities and contributing the development of the core software of the projects. The proponent of this proposal is the Director of HEPNET/Canada, which is responsible for national and international networks for the Canadian subatomic physics community. UVIC operated a simulation and analysis centre for BaBar on behalf of the BaBar-Canada group and currently operates one of the Canadian ATLAS Tier 2 sites. The UVIC group has established the first distributed ATLAS Tier 2 site using cloud computing technologies that is running in excess of 500 simultaneous simulation jobs.

We recognize that TRIUMF may have a challenge providing the space and power required for such a facility. The hardware could be situated at UVIC or another location. This would follow the distributed model being adopted at CERN where a second Tier 0 facility is being constructed in Eastern Europe.

BROADER IMPACTS:

We have a demonstrated track record in collaborating with industry, and training highly qualified personnel in areas of distributed computing, storage, and networks. We have received outside direct and in-kind funding from CANARIE, BCNET, Google, Amazon, IBM, Ciena, Brocade and DELL. We have trained over 30 undergraduate coop students in leading-edge computing technologies. Many of our students and staff have taken position in the computing industry in Canada and the US.

MAJOR MILESTONES:

Description	Date
Finalize SuperB computing model	2013
CFI application	2014
Prototype system	2015-2017
Commission new SuperB Centre	2016-2017
First beam in SuperB	2018
Ongoing operation	2017-2030

RESOURCE REQUIRMENTS:

CASH FLOW REQUIREMENTS						
\YEAR SOURCE \	ONE	TWO	THREE	FOUR	FIVE	TOTAL
TRIUMF	0	0	0	0	0	0
EXTERNAL	100K	100K	1-2 M	1-2 M	0.25-0.50 M	2.5-5.0 M
TOTAL	100K	100K	1-2 M	1-2 M	0.25-0.50 M	2.5-5.0 M
TRIUMF NON-CASH RESOURCES						
\YEAR RESOURCE\	ONE	TWO	THREE	FOUR	FIVE	TOTAL
HW space			X	X	X	
Manpower space	?	?	?	?	?	
Power/cooling			X	X	X	
Networks			X	X	X	

EXTERNAL FUNDING INFORMATION:
CFI application for hardware, commissioning manpower and operational costs
NSERC application for application-support personnel

ONGOING OPERATIONAL REQUIREMENTS:
CFI IOF funds for operational manpower. At the end of the lifetime of the hardware, another CFI application will be submitted and this will include ongoing operational support.

DECOMMISSIONING REQUIREMENT:
Hardware will be disposed of following industrial standards.

Accepted: Date: