	SuperCDMS at SNOLAB Project Office **BASIS of ESTIMATE FORM (BoE)**	**Document Number:**
		Date of Estimate: 4-Jul-16
		Prepared by: Anthony Villano

UID Number:	**WBS Section: 1.6.8**

Task Name: DAQ Integration and Testing

Cost Type:	**Costing Method:**		
	_X_Engineering Estimate	_ Prior purchase or experience Source:	___ Catalog Price Source:_____
__ M&S _X_ Labor	__Vendor Quote (attached)	__ Other- Description:_____	

Attach Relevant Documents (including but not limited to):
RFP, Responses to RFP, Technical Evaluation of RFP, Vendor Quotes, Technical Specifications, drawing numbers

Task Duration: (calendar weeks, 85% achievable): **weeks**
(this applies only for BoE's written at lowest task level)

Task M&S Cost (FY14$)**: $0K** **See cost table below** **Task M&S Contingency** (%)**: 0 %**	**Task Labor** (resource type & work hours or % for duration of task, 85% efficiency assumed)**: 1524 hours** **See labor table below** **Task Labor Contingency** (%)**: 40 %**

Change Log

Date	**Description**
2016/3/29	**Initial version: this new L3 has been split from 1.6.7**
2016/5/3	**Fix typo in hours total: decrease from 1626 to 1586**
2016/7/4	**Removed 168.101-168.105 from project, since these completed pre-CD1**

Details of Estimate: A summary of the costs is included in the table below. All costs are labor. Associated travel costs are included in WBS 1.6.9.

This L3 is designed to organize the schedule for in-situ testing for DAQ components at the facilities that are available to us before SNOLAB commissioning. It excercises the DAQ components and the warm electronics and cold hardware interfaces. The L4 tasks that make up this work are simply structured: there is a preparation and installation period (1.6.8.1,1.6.8.2); a cold hardware test (1.6.8.3); a full system test with Rev D of the DCRC boards (1.6.8.4); a full system test with Rev E of the DCRC boards (1.6.8.5); a test assembly of the SNOLAB system at TRIUMF (1.6.8.6); and just before commissioning an underground integrations test at SNOLAB (1.6.8.7).

In the preparation items (1.6.8.1, 1.6.8.2) we intend to prepare all the test facilities that will be the sites for any further testing with the appropriate hardware and software to install a full working DAQ system. For the SLAC cold hardware test (1.6.8.3) we intend to make sure the DAQ system works with the newly-completed Rev D DCRC cards. The test will especially focus on assessing the ability of the DCRC Rev D to control the new SQUIDs. For the Rev D DAQ test (1.6.8.4) we will read out a fully-functional detector using our DAQ system for the Rev D DCRC cards. For the Rev E DAQ test (1.6.8.5) we will do the same for the Rev E modifications. During the DAQ and warm electronics test at Triumf (1.6.8.6) the goal is to assemble a full scale electronics model of the SNOLAB setup and test the system for the first time with multiple towers, but without real working detectors. In the underground integrations test (1.6.8.7) we will do the same in the underground environment, and prepare the system for the arrival of the detectors and commissioning.

For the perparation tasks (1.6.8.1, 1.6.8.2) we used the already completed installation tasks to make a task list and estimate times and manpower. Each of the rest of the L4 tasks comprise a week to 2 week scale test of the equipment. The times were therefore constrained by when the prerequesits will be complete (for example, 1.6.8.3 cannot commense without the cold hardware being complete). The manpower estimates were estimated by breaking up specific tasks and mapping them onto things we've done before at test facilities, using the appropriate experts where needed. Since each of these tests are similar to a test facility "run" and we have at least two people who are familiar with this cycle providing input on this schedule (Bruno and Anthony), the tasks are expected to be a very good approximation to what is needed. Basically in a test facility run we verify the setup, tune the detectors, take data, and analyze the data for specific results. This was the basic template followed for the task list and manpower estimate.

W.B.S	Item	Labor type	
		Postdoc/student	Software Developer
1.6.8	**DAQ Integration and testing**		
1.6.8.1	**DAQ installation/upgrades at TFs**		
1.6.8.1.5	installation of MIDAS Core at SLAC	10	
1.6.8.1.6	installation of MidasTools at SLAC		10
1.6.8.1.7	installation of LazyLogger and copy scripts at SLAC	10	
1.6.8.1.8	installation of Sequencer scripts at SLAC	10	
1.6.8.1.9	development of generalized install scripts	80	
1.6.8.1.10	development of DAQ "upgrade" script	40	
1.6.8.1.11	development of scripts for driver test	40	
1.6.8.1.12	development of scripts for throughput test	40	
1.6.8.2	**DAQ/processing interface**		
1.6.8.2.1	install at the TFs who want it	80	
1.6.8.2.2	upgrade at the TFs for their processing infrastructure	80	
1.6.8.3	**DAQ Test at SLAC with Rev D**		
1.6.8.3.1	verification of drivers with test scripts	20	
1.6.8.3.2	verification of setup with throughput scripts	20	
1.6.8.3.3	detector/SQUID tuning	20	20
1.6.8.3.4	"production" data taking	20	20
1.6.8.3.5	data processing/quality evaluations	10	
1.6.8.3.6	produce modulation curves for SQUID prototypes	10	

W.B.S	Item	Labor type	
		Postdoc/ student	Software Developer
1.6.8.4	**DAQ Test at a TF with Rev D**		
1.6.8.4.1	use generalized install scripts to install at TF	16	8
1.6.8.4.2	verification of drivers with test scripts	10	
1.6.8.4.3	verification of setup with throughput scripts	10	
1.6.8.4.4	detector/SQUID tuning	20	20
1.6.8.4.5	"production" data taking	80	
1.6.8.4.6	data processing/quality evaluations	10	
1.6.8.4.7	specific data deliverables		
1.6.8.4.7.1	produce modulation curves for SQUIDs	10	
1.6.8.4.7.2	Ibls or complex impedance to test QETs	10	
1.6.8.4.7.3	triggering study using pulse data	10	
1.6.8.4.7.4	produce charge (iZIP)/phonon (iZIP/HV)/yield (iZIP) plots	10	
1.6.8.5	**DAQ Test at a TF with Rev E**		
1.6.8.5.1	verification of drivers with test scripts	10	
1.6.8.5.2	verification of setup with throughput scripts	10	
1.6.8.5.3	detector/SQUID tuning	20	20
1.6.8.5.4	"production" data taking	80	
1.6.8.5.5	data processing/quality evaluations	10	
1.6.8.5.6	specific data deliverables		
1.6.8.5.6.1	produce modulation curves for SQUIDs	10	
1.6.8.5.6.2	Ibls or complex impedance to test QETs	10	
1.6.8.5.6.3	triggering study using pulse data	10	
1.6.8.5.6.4	produce charge (iZIP)/phonon (iZIP/HV)/yield (iZIP) plots	10	
1.6.8.6	**DAQ+Warm Electronics Test at TRIUMF with Production DCRCs**		
1.6.8.6.1	develop testing program/criteria	80	
1.6.8.6.2	hardware installation	40	
1.6.8.6.3	verification of drivers with test scripts	10	
1.6.8.6.4	verification of setup with throughput scripts	10	
1.6.8.6.5	"production" data test	80	
1.6.8.6.6	evaluate results and report specific areas of concern	160	40

W.B.S	Item	Labor type	
		Postdoc/student	Software Developer
1.6.8.7	**Underground system integration test**		
1.6.8.7.1	develop testing program/criteria	80	
1.6.8.7.2	verification of software system		
1.6.8.7.2.1	database test	20	
1.6.8.7.2.2	online DQM test	20	
1.6.8.7.2.3	online processing test	20	
1.6.8.7.3	verification of drivers with test scripts	10	
1.6.8.7.4	verification of setup with throughput scripts	10	
	TOTAL	1386	138