

IceCube Institutional Memorandum Of Understanding (MOU)
Scope Of Work

<p>University of Alberta Darren Grant Ph.D Scientists (Faculty Scientist/Post Doc Grads) : 5 (4 1 5)</p>

Labor Cat.	Names	WBS L3	Tasks	WBS 2.1	WBS 2.2	WBS 2.3	WBS 2.4	WBS 2.5	WBS 2.6	Grand Total
				Program Coordination	Detector Maintenance & Operations	Computing & Data Management	Data Processing & Simulation	Software	Calibration	
KE	GRANT, DARREN	Administration	Collaboration Spokesperson	0.50						0.50
		Administration	ExecCom member		0.20					
GRANT, DARREN Total				0.70						0.70
	KOPPER, CLAUDIO	Reconstruction	IceTray framework maintenance					0.05		0.05
		Reconstruction	Maintenance of clsim direct photon propagation tool					0.10		0.10
		Simulation Production	GPU computing resources				0.10			0.10
		Online Filter (Pnf)	Diffuse WG co-chair		0.25					0.25
		Offline Data Production	Offline Processing Support / pass2				0.10			0.10
KOPPER, CLAUDIO Total					0.25		0.20	0.15		0.60
	MOORE, ROGER	Detector Calibration	DOM efficiency with cosmic muons						0.10	0.10
		Online Filter (Pnf)	TFT Board Member		0.10					0.10
MOORE, ROGER Total					0.10				0.10	0.20

	YANEZ, JUAN PABLO	Online Filter (Pnf)	LE WG co-chair	0.25					0.25	
	YANEZ, JUAN PABLO Total			0.25					0.25	
PO	WEAVER, CHRIS	Simulation Production	High energy event generator (leptoninjector), PMT simulation, atmospheric flux library			0.10			0.10	
		Offline Data Production	Offline Processing Support / pass2			0.10			0.10	
		Reconstruction	“Shield” IceTop Veto module maintenance			0.05			0.05	
		Reconstruction	Simulation and core software support				0.15		0.15	
	YANEZ, JUAN PABLO	Online Filter (Pnf)	LE WG co-chair	0.25					0.25	
HIGNIGHT, JOSHUA	Simulation Production	Simulation production site manager at Compute Canada Resource Allocation			0.25				0.25	
	Offline Data Production	Level-3 processing maintainer the low-energy working group				0.05			0.05	
	Reconstruction	Genie-icetray maintainer					0.05		0.05	
	ALBERTA, PO Total				0.25	0.05	0.05		0.35	
GR	Nowicki, Sarah	Reconstruction	Direct Reconstruction Tool Development			0.75			0.75	
	Kulacz, Nicholas (MSc)	Detector Calibration	DOM efficiency with cosmic muons					0.35	0.35	
	Sanchez Herrera, Sebastian	Reconstruction/ Analysis tools	Software / data processing (tool development)				0.35		0.35	
	Sarkar, Sourav (MSe)	Distributed Computing Resources	Grid Operations Team			0.20				0.20
		Simulation Production	PYTHIA event generator implementation and maintenance				0.15			0.15

Wood, Tania	Reconstruction/ Analysis tools	Atmospheric Flux Systematics					0.10		0.10
ALBERTA GR Total					0.20	0.90	0.45	0.35	1.90
ALBERTA Total			0.70	0.60	0.45	1.15	0.65	0.45	4.00

Faculty:

Full: Darren Grant, Claudio Kopper, Roger Moore, **Juan Pablo Yanez**

Associate (Gen2): Carsten Krauss, James Pinfold

Scientists and Post Docs:

Joshua Hignight: Simulation production site manager at Compute Canada Resource Allocation

Ph.D. Students:

Tania Wood (PhD) [graduating 2018]: (Analysis focus – low-energy atmospheric neutrino flux)

Sarah Nowicki (PhD): Direct Reconstruction tool development (Analysis focus – neutrino oscillations with DeepCore)

Sebastian Sanchez Herrera (PhD): DOM efficiency with cosmic muons (Analysis focus: BSM studies)

Sourav Sarkar (PhD): Grid Operations Team (Analysis focus: neutron capture from high-energy hadronic showers)

Diploma/Master Students:

Nicholas Kulacz (MSc): DOM efficiency with cosmic muons (Analysis focus: diffuse astrophysical fits)

Undergraduates: 6 students.

Explanation:

A Canadian Natural Science and Engineering Research Council (NSERC) Discovery Subatomic Projects grant was recently renewed for a 2-year period to support IceCube and IceCube-Gen2 activities at the University of Alberta and SNOLAB. The level of support is for 4 full-participant faculty (Clark, Grant, Kopper, Moore) and 2 associate faculty (Krauss, Pinfold). Also supported is Joshua with plans for 2 additional PDFs, up to 4 PhD students and 4 undergraduate students at the University of Alberta.

Description of service work and planned analysis:

The Alberta group is focused on analyses involving data from DeepCore, the development of the PINGU and high-energy IceCube-Gen2 project and precision studies of astrophysical flux properties such as the flavour composition. Tania's PhD thesis is the measurement of the atmospheric neutrino flux at energies to ~ 10 GeV with DeepCore. Sarah is currently working on a "direct reconstruction" tool development running photon propagation on the fly to build a reconstruction hypothesis and will complete her PhD thesis on a test of maximal θ_{atm} mixing with the 5-year DeepCore dataset. Sebastian will conclude his absolute DOM efficiency with cosmic muons and will then move to his PhD topic of beyond-the-standard-model searches. Nicholas will be taking over Sebastian's service work on DOM efficiency measurements. Sourav is working as part of the Grid Operations Team instructed by the Madison grid group and is working on creating simulation tools allowing the detailed study of very high-energy showers in IceCube simulated with Geant4 well above its original energy limit. He will then move to his PhD topic of identification of hadronic cascades using a delayed signal from neutron capture and applications in neutrino flavor fits. The undergraduates this summer will work on topics like reconstruction/minimization studies and optical calibration devices.

Computing Resources

Compute-Canada resources have been established as a primary simulation production resource for the IceCube collaboration. In 2018, a resource allocation of **1400 CPU-years** and **22 GPU-years** from Compute-Canada was awarded to support IceCube activities. Claudio finished constructing the full high-performance GPU computing cluster based on TITAN X(p) and 1080Ti GPUs in April 2018 with 144 GPUs online. **"Pyglidein" clients will be run on the clusters as much as possible to provide access to the collaboration.** Our service activities are centred on the simulation production and reconstruction developments with these resources, and calibration efforts.

GPU types:

* 22 GPU-years on Tesla P100 [Compute Canada]

* 144 GPU-years on **TITAN X(p)/1080Ti** [Claudio Kopper]