**IceCube Institutional Memorandum Of Understanding (MOU)**

**Michigan State University**

**Tyce DeYoung**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads): **5** (2 3 2)

**Scope of Work**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | **Funds Source** | **WBS 2.1** | **WBS 2.2** | **WBS 2.3** | **WBS 2.4** | **WBS 2.5** | **Grand Total** |
| Program Management | Detector Maintenance & Operations | Computing & Data Management | Triggering & Filtering | Data Quality, Reconstruction & Simulation Tools |
| KE | DeYOUNG, TYCE | Education & Outreach | Education & Outreach | Inst. In-Kind | 0.05 |  |  |  |  | **0.05** |
|  |  | Administration | Deputy Spokesperson | Inst. In-Kind | 0.25 |  |  |  |  | **0.25** |
|   | **DeYOUNG, TYCE Total** |  |  | **0.30** |  |  |  |  | **0.30** |
|   | MAHN, KENDALL | Simulation Programs | Integration of GENIE for low energy systematics | Inst. In-Kind |  |  |  |  | 0.10 | **0.10** |
|   | **MAHN, KENDALL Total** |  |  |  |  |  |  | **0.10** | **0.10** |
| PO | HIGNIGHT, JOSHUA | Simulation Production | Simulation Production | Inst. In-Kind |  |  | 0.08 |  |  | **0.08** |  |
|  |  | Simulation Programs | Integration of GENIE for low energy systematics | Inst. In-Kind |  |  |  |  | 0.20 | **0.20** |
|  | Computing Resources | Simulation production site manager at MSU | NSF M&O Core |  |  | 0.25 |  |  | **0.25** |
|   | **HIGNIGHT, JOSHUA Total** |  |  |  |  | **0.33** |  | **0.20** | **0.53** |
|  | JOAO PEDRO DE ANDRÉ | Simulation Production | Simulation Production, IceSim vetting for LowEn  | Inst. In-Kind |  |  | 0.08 |  |  | **0.08** |
|  | Reconstruction/ Analysis tools | Low energy reconstruction techniques for DeepCore | Inst. In-Kind |  |  |  |  | 0.15 | **0.15** |
|  | **DE ANDRÉ, JOAO PEDRO Total**  |  |  | **0.08** |  | **0.15** | **0.23** |
|  | LENNARZ, DIRK | Detector Monitoring | Monitoring Shifts | Inst. In-Kind |  | 0.03 |  |  |  | **0.03** |
|  | **LENNARZ, DIRK Total**  |  | **0.03** |  |  |  | **0.03** |
| GR | NEER, GARRETT | Reconstruction/ Analysis tools | Development of noise cleaning for vuvuzela noise. | Inst. In-Kind |  |  |  |  | 0.20 | **0.20** |
|  |  | Detector Monitoring | Monitoring Shifts | Inst. In-Kind |  | 0.03 |  |  |  | **0.03** |
|   | **NEER, GARRETT Total** |  |  |  | **0.03** |  |  | **0.20** | **0.23** |
| GR | RYSEWYK, DEVYN | Reconstruction/ Analysis tools | Work on improved modeling of hadronic showers in reconstruction | Inst. In-Kind |  |  |  |  | 0.30 | **0.30** |
|   | **RYSEWYK, DEVYN Total** |  |  |  |  |  |  | **0.30** | **0.30** |
| **MSU Total** |  |  |  | **0.30** | **0.06** | **0.41** | **0.00** | **0.95** | **1.72** |

Michigan State contributions to the maintenance and operations of IceCube include:

**Faculty:**

Tyce DeYoung – Deputy Spokesperson, outreach, 90% IceCube (10% HAWC)

Kendall Mahn – low energy systematics/GENIE, outreach, 15% IceCube (85% GENIE and T2K)

**Scientists and Post Docs:**

Joshua Hignight– simprod, distributed computing, DeepCore systematics studies, monitoring, 75% IceCube (25% GENIE development)

 Analysis topics: Improvements to muon neutrino disappearance analysis, joint analysis of muon disappearance and tau appearance

João Pedro A. M. de André (from Nov. 1) –

 Simprod, distributed computing, Low-En triggering and filtering, Low-En reconstruction methods, 100% IceCube

 *Reconstruction modules: MultiNest*

 Analysis topics: Tau neutrino appearance

Dirk Lennarz Monitoring shift, 70% IceCube (30% HAWC)

 Analysis topics: joint IceCube-HAWC source search

**Ph.D. Students:**

Garrett Neer Reco/analysis tools: evaluate Pegleg for standard oscillation processing in DeepCore. Development of noise cleaning for vuvuzela noise.

 Detector monitoring: shift

 Thesis/Analysis topics: solar dark matter search (low energy)

Devyn Rysewyck Reco/analysis tools: improved modeling of hadronic showers in reconstruction.

 Thesis/Analysis topics:

**Computing Resources:**

The Michigan State IceCube group has access to several large computing clusters maintained and administered by the Michigan State High Performance Computing group and the Institute for Cyber-Enabled Research, comprising a total of approximately 8,000 computing cores, including 80 Tesla K20c GPU cards.

**Note:** The activities and staffing levels in this MoU are appropriate for the one-year period beginning October 1, 2015.