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

**Scope of Work**

**South Dakota School of Mines and Technology**

**Xinhua Bai**

**Ph.D. Scientists** (Faculty Scientist/Post Doc Grads): **1** (1 0 1)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS Level 3** | **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 | Xinhua Bai | 2.1.1 Administration | SDSMT Inst. Lead | 0.05 |  |  |  |  |  | 0.05 |
|  | 2.1.4 E&O | Education & Outreach for neutrino astronomy and IceCube | 0.05 |  |  |  |  |  | 0.05 |
|  | 2.2.4 Detector Monitoring | IceCube operation monitoring |  | 0.02 |  |  |  |  | 0.02 |
|  | 2.5.3 Reconstruction  | High energy cosmic rays, prompt muon, and muon bundle reconstruction basis and new methods  |  |  |  |  | 0.38 |  | 0.38 |
|  |  | 2.1.2 Engineering and R&D Support | Detector development and testing  | 0.50 |  |  |  |  |  | 0.50 |
|   | **Bai, Xinhua Total** |  | **0.60** | **0.02** |  |  | **0.38** |  | **1.00** |
| GR | Emily Dvorak  | 2.4.2 Simulation production  | Filter or pre-processing MC events for the IceTop and in-ice combined reconstruction tools development and prompt muon research  |  |  |  | 0.15 |  |  | 0.15 |
|  | 2.5.3 Reconstruction  | IceTop and in-ice combined reconstruction, prepare for the prompt analysis |  |  |  |  | 0.85 |  | 0.85 |
| **Dvorak, Emily Total**  |  |  |  |  | **0.15** | **0.85** |  | **1.00** |
| **South Dakota School of Mines & Technology Total** | **0.60** | **0.02** |  | **0.15** | **1.23** |  | **2.00** |

**Note: Gen-2 contributions not relevant to IceCube M&O are highlighted in blue (Total: 0.75 FTE)**

**Faculty:**

Xinhua Bai (100% effort) – Institution lead, study of new reconstruction techniques, mentoring Ph.D. student, education/outreach, improve high energy EAS energy and composition reconstruction, IceCube-Gen2. (Note: Dr. Bai has lab resources and enough experience to make contributions to IceCube-Gen2. However, detailed work still needs to be discussed.)

**Grad Students:**

Emily Dvorak (100% effort) –The two foci of her work are: (1) To develop software tools, jointly with researchers in the IceCube Cosmic-Ray Working Group, for the reconstruction of air shower events that trigger both the IceTop and in-ice array but with the shower core landing outside the IceTop array; (2) To search and measure prompt muon yield in high energy cosmic ray induced showers with a new method based on the stochastic energy loss by muon bundles.