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

**Scope of Work**

**Massachusetts Institute of Technology**

**Janet M. Conrad**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads): **2** (1 1 3)

|  |  |  |  |  |  |  |  |  |  |  |
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| **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 | Janet M. Conrad | 2.1.1 Administration | ICB member | 0.05 |  |  |  |  |  | 0.05 |
|  | 2.1.4 Education & Outreach | CosmicWatch | 0.05 |  |  |  |  |  | 0.05 |
|  | **Janet M. Conrad Total** | |  | **0.10** |  |  |  |  |  | **0.1** |
| PO | David Vannerom | 2.5.2 Simulation Software | Development of GolemFit |  |  |  |  | 0.1 |  | 0.1 |
|  | 2.5.2 Simulation Software | Extension of LeptonInjector to include Beyond Standard Model particles |  |  |  |  | 0.3 |  | 0.3 |
|  | **David Vannerom Total** | |  |  |  |  |  | **0.4** |  | **0.4** |
| GR | Philip Weigel | 2.5.2 Simulation Software | Development of GolemFit |  |  |  |  | 0.10 |  | 0.10 |
|  | **Philip Weigel Total** | |  |  |  |  |  | **0.10** |  | **0.10** |
|  | Marjon Moulai | 2.5.1 Core Software | Atmospheric fluxes library from MCEq with uncertainties |  |  | 0.2 |  |  |  | 0.2 |
|  | **Marjon Moulai Total** | |  |  |  | **0.2** |  |  |  | **0.2** |
|  | Alejandro Diaz | 2.4.3 Public Data Products | Organize and maintain BSM public data release page |  |  |  | 0.10 |  |  | 0.1 |
|  |  | 2.5.2 Simulation Software | Development of GolemFit |  |  |  |  | 0.10 |  | 0.1 |
|  | **Alejandro Diaz Total** | |  |  |  |  | **0.10** | **0.10** |  | **0.2** |
| **MIT Total** | | | | **0.10** | **0.0** | **0.20** | **0.10** | **0.60** | **0.0** | **1.00** |

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| **IceCube Upgrade** | | | | | | | | | | |
| **Labor Cat.** | **Names** | **WBS Level 3** | **Tasks** | **WBS 1.1** | **WBS 1.2** | **WBS 1.3** | **WBS 1.4** | **WBS 1.5** | **WBS 1.6** | **Grand Total** |
| Project Office | Drilling | Sensors | Comms, Power, Timing | Calibration | Data Systems |
| KE | Janet M. Conrad | Project Management | Coordinate Fermilab beamtest and electronics development | 0.05 |  |  |  |  |  | 0.05 |
|  | **Janet M. Conrad Total** | |  | **0.05** |  |  |  |  |  | **0.05** |
| PO | David Vannerom | Calibration Assembles | FermiLab Beam-test development |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Special Devices | “Brusselsprots” electronics w/Harvard |  |  | 0.10 |  |  |  | 0.10 |
|  | **David Vannerom Total** | |  |  |  | **0.10** |  | **0.10** |  | **0.20** |
| GR | Philip Weigel | Calibration Assembles | FermiLab Beam-test development |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Special Devices | “Brussel sprouts” electronics w/ Harvard |  |  | 0.10 |  |  |  | 0.10 |
| **Philip Weigel Total** | |  |  |  | **0.10** |  | **0.10** |  | **0.20** |
| Marjon Moulai | Calibration Assembles | FermiLab Beam-test development |  |  |  |  | 0.10 |  | 0.10 |
|  | **Marjon Moulai Total** | |  |  |  |  |  | **0.10** |  | **0.10** |
|  | Alejandro Diaz | Special Devices | “Brussel sprouts” electronics w/ Harvard |  |  | 0.10 |  |  |  | 0.10 |
|  | **Alejandro Diaz Total** | |  |  |  | **0.10** |  |  |  | **0.10** |
| **MIT Total** | | |  | **0.05** | **0.00** | **0.30** | **0.00** | **0.30** | **0.00** | **0.65** |

**Faculty:**

Janet M. Conrad – Institution lead, member of the ICB, organizer of CosmicWatch outreach.

**Scientists and Post Docs:**

David Vannerom -- M&O responsibility is in maintaining and improving GolemFit. Extending Lepton Injector to allow the inclusion of Beyond the Standard Model particlesAnalysis Topics: Analysis: Work on a search for neutral heavy leptons with IceCube-DeepCore.

**Grad Students:**

Marjon Moulai – (5nd year) Constructing a new parameterization to incorporate the uncertainty in the cosmic-ray spectrum and composition.

Analysis Topics: Develop neutrino decay analysis with the MEOWS sample.

Alejandro Diaz – (4th year) Developing systematic treatment for MEOWS high-energy extension. Organize BSM-wg data repository and work on the development of GolemFit.

Analysis Topics: Extended MEOWS.

Philip Weigel – (1th year) Developing systematic treatment for MEOWS high-energy extension. Work in the development of GolemFit.

Analysis Topics: Extended MEOWS.