**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)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | Engineering and R&D support  | Test beam development | 0.05 |   |   |   |   |  | 0.05 |
|  | Engineering and R&D support | mTOM development and in-ice scintillator studies | 0.05 |   |   |   |   |  | 0.05 |
|   | **Janet M. Conrad Total** |  | **0.10** |  |  |  |  |  | **0.10** |
| PO | Carlos Argüelles Delgado | Simulation Software | nuSQuIDS, LeptonInjector/LeptonWeighter, and MC reweighting development. Fitter tools: GolemFit. |   |  |   |   | 0.30 |  | 0.30 |
|  |  | Core Software | Atmospheric neutrino parametrizations |  |  |  |  | 0.20 |  | 0.20 |
|  |  | Administration | IceCube Summer Bootcamp | 0.05 |   |   |   |   |  | 0.05 |
|  | **Carlos Arguelles Total** |  | **0.05** |  |  |  | **0.50** |  | **0.55** |
| GR | Spencer Axani | Simulation Software | Pass 2 and calibration work |  |  |  |  |  0.10 |  | 0.10 |
|  |  | Outreach & Outreach | Desktop muon counters | 0.20 |  |  |  |  |  | 0.20 |
|  | **Spencer Axani Total**  |  | **0.20** |  |  |  | **0.10** |  | **0.30** |
|  | Marjon Moulai | Detector Calibration | Lab measurements of absolute DOM calibration |  |  |  |  |  | 0.15 | 0.15 |
|  |  | Engineering and R&D support | Test beam execution | 0.15 |  |  |  |  |  | 0.15 |
|  | **Marjon Moulai Total**  |  | **0.15** |  |  |  |  | **0.15** | **0.30** |
|  | Gabriel Collin | Reconstruction  | NonPoissonian Template Fitting code |  |  |  |  | 0.25 |  | 0.25 |
|   | **Gabriel Collin Total**  |  |  |  |  |  | **0.25** |  | **0.25** |
| **MIT Total** | **0.40** | **0.0** | **0.0** | **0.0** | **0.85** | **0.15** | **1.40** |

**Note: Gen-2 contributions not relevant for IceCube M&O are highlighted in blue (Total: 0.10 FTE)**

 **Faculty:**

Janet M. Conrad – Institution lead, M&O responsibilities in R&D (2.1.2) including proposing a FNAL testbeam run at to constrain particle simulations for IceCube and PINGU (this project is being organized by Teppei Katori) and studying isolated optical modules (mTOMs) for PINGU. Study the impact and feasibility of deploying in-ice scintillator to enhace IceCube particle physics and astrophysics capabilitles.

**Scientists and Post Docs:**

Carlos Argüelles -- M&O responsibility is in maintaining and improving his simulation code for use in the 5 year IC86 analysis. Specific projects are 1) speeding up nuSQuIDS, 2) supporting the transition from NuGen to LeptonInjector/LeptonWeighter, 3) developing new tools for estimation of muon backgrounds, 4) development and support of GolemFit.

Analysis Topics: Work on the multiyear high-energy sterile analysis (HESA). Work on multiyear LorentzViolation analysis with HESA. Work on the HESE BSM analyses. Help organizing the MESE taskforce analyses plan. Develop the neutrino decay analysis with HESA. Begin outlining the NSI-using-TeV-neutrinos analysis. Write papers arising from the HESE taskforce work.

**Grad Students:**

Spencer Axani – (4nd year) M&O responsibility is in Data Quality, Reconstruction and Simulation (2.5.1), presently concentrating on performing pass2 checks and Monte Carlo for the multiyear sterile neutrino analysis. Document work on new SPE parameterization. M&O responsibilities in R&D (2.1.2) consist of developing the desktop muon counters used for IceCube outreach.

Analysis Topic: IC86 sterile neutrino analysis using 7-year data set, aka the HESA sample.

Marjon Moulai – (4nd year) Study of atmospheric neutrino systematic uncertainties by means of the Barr parameterization. Implement the Barr parameterization in GolemFit.

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

Gabriel Collin – (5rd year) Has defended his thesis and will graduate June 1. He is spending 4 months as a temporary postdoc in our group to finish up papers and then will begin is primary postdoc position on Sept 15.

Analysis Topics: NPFT analysis.