**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 4)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | 0.05 |   |   |   |   |  | 0.05 |
|   | **Janet M. Conrad Total** |  | **0.10** |  |  |  |  |  | **0.10** |
| PO | Carlos Argüelles Delgado | Simulation Software | nuSQuIDS, NuSFGen, and MC reweighting development |   |  |   |   | 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 | Gabriel H. Collin | Simulation Software | Ice model MCMC |   |  |    | 0.50 |   |  | 0.50 |
|   |   | Simulation Software | nuSQuIDS model update |   |   |   |  | 0.10  |  | 0.10 |
|  |  | Administration | IceCube Summer Bootcamp | 0.05 |  |  |  |  |  | 0.05 |
|   | **Gabriel H. Collin Total**  |  | **0.05** |  |  | **0.50** |  **0.10** |  | **0.65** |
|  | 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** |
|  | Nick Rodd | Reconstruction  | NonPoissonian Template Fitting code |    |  |  |  | 0.25 |  | 0.25 |
|   | **Nick Rodd Total**  |  |  |  |  |  | **0.25** |  | **0.25** |
| **MIT Total** | **0.55** | **0.0** | **0.0** | **0.50** | **0.95** | **0.15** | **2.15** |

**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.

**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) updating NuFSGen to represent the 5 year data set and 3) speeding up the analysis by improving the reweighting algorithm for MC events. Also expand on atmospheric neutrino parametrization, in collaboration with A. Fedynitch, focusing on the 1-100 TeV range

Analysis Topics: Bring the 1-year IC86 sterile neutrino analysis to publication, and start organizing the 5-year IC86 analysis. Develop the neutrino decay analysis. Begin outlining the NSI-using-TeV-neutrinos analysis.

**Grad Students:**

Spencer Axani – (3nd 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, as well as starting the event selection for the 1 to 100 TeV range of data in the 5 year data set. 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 5-year data set.

Gabriel Collin – (5th year) M&O responsibility is to perform studies of the ice model parameters uncertainties via a MCMC and develop new methods for photon propagation in order to speed up Monte Carlo generation. Provide support and updates to nuSQuIDS as needed for the analysis.

Analysis Topics: NPFT analysis, IC86 sterile analysis using 5-year data set and neutrino decay analysis.

Marjon Moulai – (3nd year) Calibration (2.6.1) work will be related to measurement of absolute DOM efficiency in the lab. R&D (2.1.1) is on working on the testbeam run to be performed at Fermilab during the summer, which is being led by Teppei Katori.

Analysis Topics: TBD. Will begin in the Osc-Low En group.

Nick Rodd – (4rd year) IceCube is only one component of his thesis. M&O responsibility in Data Quality, Reconstruction and Simulation (2.5.1.) is on introducing the the NonPoissionian Template Fit Input. Focus is in the 1-100 TeV range.

Analysis Topics: NPFT analysis.