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

**Scope of Work**

**University of Alabama**

**Dawn Williams**

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | **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 | Williams, Dawn | Detector Calibration | Managing flasher runs and coordinating low level calibration effort |  | | 0.20 | |  | |  | |  | 0.20 |
|  |  | TFT Coordination | TFT board member |  | |  | |  | | 0.10 | |  | 0.10 |
|  |  | Physics Filters | Tau WG lead |  | |  | |  | | 0.25 | |  | 0.25 |
|  | **Williams, Dawn Total** | |  |  | | **0.20** | |  | | **0.35** | |  | **0.55** |
|  | Toale, Patrick | Reconstruction/Analysis Tools | Double cascade fitter |  | |  | |  | |  | | 0.05 | 0.05 |
|  | **Toale, Patrick Total** | |  |  | |  | |  | |  | | **0.05** | **0.05** |
| PO | Palczewski, Tomasz | Detector Calibration | Domcal monthly vetting |  | 0.10 | |  | |  | |  | | 0.10 |
|  |  | Detector calibration | SPE recalibration |  | 0.05 | |  | |  | |  | | 0.05 |
|  |  | Detector Monitoring | Monitoring shifts |  | 0.05 | |  | |  | |  | | 0.05 |
|  |  | Simulation Programs | Ice simulation |  |  | |  | |  | | 0.35 | | 0.35 |
|  | **Palczewski , Tomasz Total** | |  |  | **0.20** | |  | |  | | **0.35** | | **0.55** |
| GR | Xu, Donglian | Simulation Programs | Tau simulation verification |  | |  | |  | |  | | 0.10 | 0.10 |
|  |  | Reconstruction/Analysis Tools | Double pulse algorithm development |  | |  | |  | |  | | 0.10 | 0.10 |
|  | **Xu, Donglian Total** | |  |  | |  | |  | |  | | **0.20** | **0.20** |
|  | Pepper, James | Detector Calibration | I3Live C&V |  | | 0.05 | |  | |  | |  | 0.05 |
|  |  | Simulation Programs | Dark Matter signal simulation |  | |  | |  | |  | | 0.15 | 0.15 |
|  | **Pepper, James Total** | |  |  | | **0.05** | |  | |  | | **0.15** | **0.20** |
| **UA Total** | | |  |  | **0.45** | |  | | **0.35** | | **0.75** | | **1.55** |

**Faculty:**

Dawn Williams – Institutional Lead, Calibration Coordinator, TFT Board Member, Cascade-Tau Working Group Co-Coordinator

Patrick Toale – hybrid reconstruction tools

**Scientists and Post Docs:**

Tomasz Palczewski – SPE recalibration, monitoring shifts, domcal monthly vetting

**Ph.D. Students:**

Donglian Xu - high energy cascade and tau simulation verification, tau double pulse algorithm development

Thesis/Analysis topics: atmospheric tau appearance analysis

James Pepper - verification monitoring, dark matter signal simulation

Thesis /Analysis topics: WIMP analysis

**UA General M&O (non-science) IceCube Responsibilities and Contributions:**

The Alabama Group’s major responsibilities and contributions towards maintenance and operations of the IceCube experiment include:

* Primary institutional responsibility for overseeing flasher operations and software.
* Major responsibility for calibration coordination, including ice model working group activities and domcal monthly vetting
* Major responsibility for tau neutrino analysis, cascade-tau working group co-lead

**Analysis:** The main analysis focus at the University of Alabama is searching for the lowest energy tau neutrinos that are identifiable “double pulses”. At energies at and above 100 TeV, the “double bang” signature of a high energy tau neutrino reduces to a double pulse in an individual IceCube waveform. There is no appreciable tau signal from the atmosphere at these energies, so a tau signature such as a double pulse would be strong evidence of cosmological origin.

Alabama is also working on analysis of cascade events from gravitino dark matter; including both simulation and reconstruction tools for such events.