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

**Scope of Work**

**University of Wisconsin - Madison**

**Albrecht Karle**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads): **19** (5 14 13)

| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | **Funds Source** | **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 | HALZEN, FRANCIS | Administration | Principle Investigator,  | NSF M&O Core | 0.35 |   |   |   |   | 0.35 |
|   |   |  | Inst. In-Kind | 0.15 |  |  |  |  | 0.15 |
|   | **HALZEN, FRANCIS Total** |  | **0.50** |  |  |  |  | **0.50** |
|   | KARLE, ALBRECHT | Administration | Associate Director for Science | NSF M&O Core | 0.25 |   |   |  |   | 0.25 |
|   |   | Coordination committee chair | NSF M&O Core | 0.10 |  |  |  |  | 0.10 |
|   |   | ExecCom Member | Inst. In-Kind | 0.20 |  |  |  |  | 0.20 |
|  | **KARLE, ALBRECHT Total** |  | **0.55** |  |  |  |  | **0.55** |
| SC | CHIRKIN, DMITRY | Reconstruction/ Analysis tools | Direct photon tracking / ice- properties calibration  | Base Grants |   |   |   |   | 0.15 | 0.15 |
|  |  | Reconstruction/ Analysis tools | Reconstruction software | NSF M&O Core |   |   |   |   | 0.15 | 0.15 |
|   |   | Simulation Programs | Maintain and Verify Simulation of Photon Propagation and update Ice Properties | NSF M&O Core |   |   |   |   | 0.35 | 0.35 |
|   | **CHIRKIN, DMITRY Total** |  |  |  |  |  |  | **0.65** | **0.65** |
|   | DESIATI, PAOLO | Simulation Production | Coordination of Simulation Production | NSF M&O Core |   |   | 0.40 |   |   | 0.40 |
|   |  | Simulation Production | Simulation Production panel chair | Inst. In-Kind |   |   | 0.20 |   |   | 0.20 |
|   | **DESIATI, PAOLO Total** |  |  |  |  | **0.60** |  |  | **0.60** |
|  | DUVERNOIS, MICHAEL | Engineering and R&D Support | Specialized simulations, designing new filters, unusual data selections, extracting specialized information | NSF M&O Core | 0.25 |   |   |   |   | 0.25 |
|  |  | Engineering and R&D Support | Ongoing EMI studies & mitigation, South Pole & Northern test site instrumentation, Summer South Pole field work | NSF M&O Core | 0.25 |   |   |   |   | 0.25 |
|   | **DUVERNOIS, MICHAEL Total** |  | **0.50** |  |  |  |  | **0.50** |
|   | HOSHINA, KOTOYO | Simulation Programs | NuGen maintenance | NSF M&O Core |   |   |  |   |  0.25 | 0.25 |
|   | **HOSHINA, KOTOYO Total** |  |  |  |  |  | **0.25** | **0.25** |
|  | KELLEY, JOHN | Detector Maintenance & Ops | Detector Maintenance and Operations Manager  | NSF M&O Core |  | 0.75 |  |  |  | 0.75 |
|  |  | Data Acquisition | DOM Cal Maint. DOM issues | NSF M&O Core |   | 0.15 |   |   |   | 0.15 |
|   | KELLEY, JOHN **Total** |  |  | **0.90** |  |  |  | **0.90** |
|   | WENDT, CHRISTOPHER | Detector Calibration | Flasher output, flasher calibration | NSF M&O Core |   | 0.20 |   |   |   | 0.20 |
|   |  | Detector Calibration | Absolute DOM sensitivity | NSF M&O Core |   | 0.40 |   |   |   | 0.40 |
|   |  | Detector Calibration | DOM charge response, linearity, DOM cal support | NSF M&O Core |   | 0.20 |   |   |   | 0.20 |
|   | **WENDT, CHRISTOPHER Total** |  |  | **0.80** |  |  |  | **0.80** |
| PO | AUFFENBERG, JAN | Physics filters | Online filters (EHE), IceTop Veto | Base Grants |  |  |  | 0.15 |  | 0.15 |
|  | Reconstruction / Analysis Tools | Energy Reconstruction | Base Grants |  |  |  |  | 0.15 | 0.15 |
|  | Offline Data Processing | EHE | Base Grants |  |  |  |  | 0.15 | 0.15 |
|  | **AUFFENBERG, JAN Total** |  |  |  |  |  | **0.15** | **0.30** | **0.45** |
|  | DAY, MELANIE | Simulations Production | Low energy simulation production, event reconstruction | Base Grants |  |   | 0.25  |  |  | 0.25 |
|   | DAY, MELANIE **Total** |  |  |  |  | **0.25** |  |  | **0.25** |
|   | KOPPER, CLAUDIO | Simulations Programs | Direct photon propogation, IceTray, Simulations, Genie | Base Grants |  |   |  |   | 0.25 | 0.25 |
|  |  | Offline Data Processing | L2 offline processing  | NSF M&O Core |  |  |  |  | 0.30 | 0.30 |
|   | **KOPPER, CLAUDIO Total** |  |  |  |  |  |  | **0.55** | **0.55** |
|  | NEILSON, NAOKO | Offline Data Processing | L2 offline processing  | NSF M&O Core |  |  |  |  | 0.25 | 0.25 |
|  |  | Reconstruction/ Analysis tools | Point source coordinator  | Base Grants |  |  |  |  | 0.20 | 0.20 |
|  | **NEILSON, NAOKO Total** |  |  |  |  |  |  | **0.45** | **0.45** |
|  | SANTANDER, MARCOS | Data Production Processing  | optimize the efficiency ofSimulation Production | NSF M&O Core |   |  |  0.50 |   |   | 0.50 |
|   | **SANTANDER, MARCOS Total** |  |  |  |  | **0.50** |  |  | **0.50** |
|   | WHITEHORN, NATHAN | Reconstruction/ Analysis tools | Event Reconstruction | Base Grants |   |   |   |  | 0.20 | 0.20 |
|   |  | Core Software | IceTray support, software maintenance | Base Grants |   |   |  0.15 |   |  | 0.15 |
|   | **WHITEHORN, NATHAN Total** |  |  |  |  | **0.15** |  | **0.20** | **0.35** |
|   | UW PO | Detector Monitoring | Monitoring shifts | Base Grants |   | 0.12 |   |   |   | 0.12 |
|   | **UW PO Total** |  |  |  | **0.12** |  |  |  | **0.12** |
| GR | FEINTZEIG, JACOB | Detector Calibration | Ice Properties/DOM absolute sensitivity | Base Grants |  | 0.10 |  |  |  | 0.10 |
|  |  | Reconstruction/ Analysis tools | Event reconstruction (spline fits) | Base Grants |  |  |  |  | 0.10 | 0.10 |
|  | Offline Data Processing | L3 processing, muon stream | Base Grants |  |  |  |  | 0.10 | 0.10 |
|  | GLADSTONE, LAURA | Reconstruction/ Analysis tools | Deep Core  | Base Grants |   |   |   |  | 0.15 | 0.15 |
|  | MCNALLY, FRANK | Simulation Production | IceTop Simulation Production / Data Processing | Base Grants |   |   | 0.30 |   |   | 0.30 |
|  | Riedel, BenediKt | Simulation Programs | Supernova simulation tools | Base Grants |  |  |   |   | 0.20 | 0.20 |
|  |  | Supernova System | Supernova DAQ | Base Grants |   |  0.15 |   |   |  | 0.15 |
|  | VAN SANTEN, JAKOB | Reconstruction/ Analysis tools | Cascades | Base Grants |  |  |  |  | 0.15 | 0.15 |
|  | Simulation programs | Muongun | Base Grants |   |  |  |  | 0.20 | 0.20 |
|   | WEAVER, CHRISTOPHER | Data Acquisition | DOM CAL Maintenance | Base Grants |   | 0.20 |   |   |   | 0.20 |
|   | Physics filters | Online filters | Base Grants |   |  |   |  0.10 |   | 0.10 |
|   | JERO, KYLE | Detector Calibration | DOM Linearity, sensitivity | Base Grants |   | 0.15 |   |   |   | 0.15 |
|   | Detector Calibration | Ice properties (anisotropy) | Base Grants |   | 0.25 |   |   |   | 0.25 |
|   | UW GR | Detector Monitoring | Monitoring shifts | Base Grants |   | 0.12 |   |   |   | 0.12 |
|   | **GR Total** |  |  |  | **0.97** | **0.30** | **0.10** | **0.90** | **2.27** |
| **UW – Madison Total** |  |  | **1.55** | **2.79** | **1.80** | **0.25** | **3.30** | **9.69** |

**Faculty:**

At UW-Madison physics faculty teach half-time, one course per semester. Additionally, faculty who are members of WIPAC (Karle, Halzen, Westerhoff, Vandenbroucke) are relieved of teaching for one semester per year. Thus faculty are on research except for the time spent on teaching one course per year.

Karle, Albrecht Interim Director of Operations, Assoc. Director for Science & Instrumentation, Institutional Lead, Coordination Committee (Chair), ExecCom member

Halzen, Francis Principal Investigator

Westerhoff, Stefan Cosmic Rays with IceCube and IceTop.

Vandenbroucke, Justin (Started in September 2013) Low energy physics, IceCube analysis

Gallagher, John Selection of candidate point sources of neutrinos, catalogues for stacking searches and multi-wavelength observations.

**Scientists:**

Ahlers, Marcus (John Bahcall Fellowship). Analysis: GRB physics analysis, neutrino sources

Benzvi, Segev (50%) Analysis: Cosmic rays, down going muons

Chirkin, Dmitry Service: Direct photon tracking with graphics computers / ice properties calibration; event reconstruction software, Simulation Programs, event recon.

 Analysis: atmospheric neutrinos, energy reconstruction of high energy events, ice properties.

Desiati, Paolo Service: Simulation Production Coordinator, Sim. Prod. Panel Chair

DuVernois, Michael (50%) Service: Engineering Support and R&D Science Support

Hoshina, Kotoyo (75% appointment with University of Tokyo, based in Madison)

 Service: Simulation Programs - nugen maintenance

 Analysis: Earth Core neutrino absorption (Tokyo)

Kelley, John (90%) Service: Detector Maintenance and Operations Manager, DOM Cal Maintenance, DOM issues technical analysis

Wendt, Christopher (80%) Service: Flasher output, Flasher Calibrations; DOM sensitivity, Supporting DOM charge response (lab, flashers), DOM Cal support

**Post Docs:**

Auffenberg, Jan (Leaving at the end of October 2013)

 Service: Offline Data Processing (EHE), Online filters (EHE), Energy Recon.

 Analysis: Air Showers. IceTop Veto and Radio R&D

Day, Melanie Service: Low energy simulation production

 Analysis: Deep Core Analysis, neutrino oscillations

Imran, Asif Analysis: Analysis of IceCube / IceTop cosmic ray data; GRB neutrino analysis

Kopper, Claudio (John Bahcall Fellowship). Service: offline L2, direct photon tracking, software support

 Analysis: Cascade analysis, PeV starting neutrinos

Neilson, Naoko Service: IceTray Support (Q frame), Offline Level 2 Processing.

 Analysis: Point source analysis of 79, 86 and contained vertex events.

Whitehorn, Nathan Service: Event Reconstruction, IceTray support, software maintenance

 Analysis: GRB analysis, PeV starting neutrinos

Santander, Marcos Service: calibration – moon shadow online analysis, optimize the efficiency of Simulation Production

 Analysis: cosmic ray anisotropy in IceCube and IceTop, study of energy spectrum in "hot spots" and "cold spots" of CR skymap

**Grad Students** (supervisor)**:**

Arguelles, Carlos (FH) Analysis: Sterile neutrinos and atmospheric solar neutrinos

Feintzeig, Jacob (AK) Service: Ice Properties Calibration, event reconstruction (spline fitting), IC86 2012 L3 muon offline processing, online processing support (muon channel)

 Analysis: muons, point sources IC79, IC86-1, HESE, MESE

Gladstone, Laura (AK) Service: Reconstruction tools - deep core

 Thesis topic: Neutrino oscillations with Deep Core

Griffith, Zachary (SW) Thesis /Analysis topics: search for gamma-ray sources in IceTop with IceCube muon veto

Jero, Kyle (AK) Service: DOM linearity, sensitivity; Ice properties – anisotropy, detector R&D

 Analysis: point sources, atmospheric neutrino veto

Kheirandish, Ali (FH) Service: Supernova system rate studies

 Analysis: Supernova, GRB

McNally, Frank (SW) Service: IceTop simulation production/data processing

 Analysis: IceTop anisotropy, study of composition as a function of sky location, cosmic-ray spectrum and composition with IceCube/IceTop

Middlemas, Erin (AK) Service: Cascade event reconstruction

 Analysis: Point source analysis, galactic sources

Riedel, Benedikt (RM) Service: Supernova simulation, pDAQ testing for supernovae (investigating its robustness for a bright event), SNEWS and supernova alert maintenance

 Thesis topic: Supernova neutrinos with IceCube

Sabbatini, Luca (FH) Service: shower reconstruction, flasher data

 Thesis /Analysis topics: TBD

Tobin, Moriah (AK) Analysis: Atmospheric neutrino studies using IceCube's DeepCore.

Van Santen, Jakob (AK) Service: Calibration of DOM waveforms, cascade offline filter support, new simulation production tools (muon gun)

 Thesis topic: “Measurement of contained neutrino interactions above 1 TeV in IceCube: Comparison with atmospheric predictions and investigation for an astrophysical component.”

Weaver, Chris (AK) Service: DOM Cal maintenance

 Thesis topic: “Diffuse astrophysical muon neutrinos”