IceCube Institutional Memorandum Of Understanding (MOU)

Scope Of Work

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| Niels Bohr Institute – Københavns UniversitetD. Jason KoskinenPh.D Scientists (Faculty Scientist/Post Doc Grads) : 5 (2 3 1) |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Labor Cat. | Names | WBS L3 | 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 | KOSKINEN, D. JASON | 2.1.1 Administration | Pubcom member | 0.10 |  |  |  |  |  | 0.10 |
|  |  | 2.1.4. Education & Outreach  | Speaking engagements (high school classes, open houses) | 0.05 |  |  |  |  |  | 0.05 |
|  | **KOSKINEN, D. JASON Total** |  | **0.15** |  |  |  |  |  | **0.15** |
| PO | STUTTARD, TOM | 2.4.1 Offline Data Production | OscNext Event Selection |  |  |  | 0.20 |  |  | 0.20 |
|  |  | 2.2.3 Online Filter (Pnf) | Oscillation WG co-convenor |  | 0.25 |  |  |  |  | 0.25 |
|  |  | 2.5.1 Core Software | PISA |  |  |  |  | 0.10 |  | 0.10 |
|  | MEDICI, MORTEN | 2.1.4 Education & Outreach | Speaking Engagements | 0.05 |  |  |  |  |  | 0.05 |
|  | **NBI PO Total** |  |  | **0.05** | **0.25** |  | **0.20** | **0.10** |  | **0.55** |
| GR | BOURBEAU, ETIENNE | 2.1.4 Education & Outreach | Speaking Engagements | 0.05 |  |  |  |  |  | 0.05 |
|  |  | 2.6.1 Detector Calibration | Individual DOM efficiency |  |  |  |  |  | 0.10 | 0.10 |
|  |  | 2.2.4 Detector Monitoring | Monitoring shifts |  | 0.05 |  |  |  |  | 0.05 |
|  | **NBI GR Total** | **0.05** | **0.05** |  |  |  | **0.10** | **0.20** |
| NBI Total |  |  | **0.25** | **0.30** |  | **0.20** | **0.10** | **0.30** | **1.15** |

Contribution from Master Students

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| Master Students | Ida Storehaug |  | MCEq, DirectReco |  |  |  |  | 0.75 | 0.75 |
|  | Thomas Halberg |  | IceCube-Upgrade for “DirectReco” |  |  |  |  | 0.75 | 0.75 |
|  | **NBI Master Student Total** |  |  |  |  | **1.50** | **1.50** |

**IceCube Upgrade**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | **Funds Source** | WBS 1.1 | WBS 1.2 | WBS 1.3 | WBS 1.4 | WBS 1.5 | WBS 1.6 | **Grand Total** |
| Project Office | Gen2 EHWD | Deep Ice Sensor Modules | Comms Power Timing | Calibration and Characterization | M&O Data Systems Integration |
| PO | RAMEEZ, MOHAMED | TBD | Low energy reconstruction |  |  |  |  |  |  |  | 0.15 |
|  | STUTTARD, TOM | TBD | Upgrade L3 simulation |  |  |  |  |  |  |  | 0.15 |
|   |  |  |  |  |  |  |  |  |  | **0.30** |
| NBI Total |  |  |  |  |  |  |  |  | **0.30** |

**Faculty:**

D. Jason Koskinen: PINGU/IC-Upgrade and low-energy simulation, tau neutrino appearance, 100% IceCube

Markus Ahlers: cosmic-ray anisotropy analysis, neutrino sources, “neutrino source” WG co-convenor

**Scientists and Post Docs:**

Tom Stuttard, Mohammed Rameez, Morten Medici

**Ph.D. Students:**

Etienne Bourbeau: Maintainer of Vuvuzela noise model, 2MRS correlation w/ IceCube multiplets, SNOLab DOM noise

Thesis/Analysis topics: Extended Tau Neutrino Appearance Measurement in DeepCore

**Diploma/Master Students:**

1 FTE of total service work is being done by MSc students:

Lea Halser: A Comprehensive Study of Neutrino Transients with IceCube DeepCore/Upgrade

Ida Storehaug (atm. nu flux systematics and MCEq), Thomas Halberg (DirectReco for DeepCore and IC-Upgrade), and Mia Nielsen (LE transient search using GRECO)

**Description of Service work**

We generated DeepCore/PINGU/IC-Upgrade MuonGun files and with our 10 card GPU farm. NBI is responsible for refining and maintaining the correlated noise simulation. Etienne spent months at SNOLab making underground DOM measurements. Tom organized and hosted the weeklong IC-Upgrade Sim/Reco workshop. For IC-Upgrade Rameez is working on the mDOM reconstruction. Ida is working on integrating and verifying MCEq for atm. flux systematics. Thomas is working on getting DirectReco tested w/ DeepCore and expanding it for use w/ mDOMs in the IC-Upgrade.

 The NBI IceCube group also organized a local Masterclass for students of regional High School classes. Markus summarized IceCube's particle physics activities on the NBI Discovery Day.

**Computing Resources**

|  |  |  |
| --- | --- | --- |
|  | **2016** | **2017** |
|  | **CPU Cores**  | **GPU Cards** | **CPU Cores** | **GPU Cards** |
| **IceCube**  | 0 |  | 0 |  |
| **PINGU** | 0 | 10 | 0 | 10 |
| **Gen2**  |  |  |  |  |

Due to offsite and remote access issues there is additional work in order to get the necessary glide-ins necessary for automated simprod production.

We have 10 K20 cards with the following setup.

- 2x E5-2650v2 (8 core, @2.6 GHz, 10% faster than E5-2670)

- 64GB memory

- Max 4x Nvidia K10 GPUs, full bandwidth (16x PCIe 3) simultaneously to all GPUs.