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

**Scope of Work**

**RWTH Aachen**

**Christopher Wiebusch**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads Master): **1** (1 0 7 7)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | WIEBUSCH, CHRISTOPHER | 2.1.4 Education & Outreach | AIS3 | 0.10 |  |  |  |  |  | 0.10 |
|  |  |  |  |  |  |  |  |  |  |  |
|   | **WIEBUSCH, CHRISTOPHER Total** |  | **0.10** |  |  |  |  |  | **0.10** |
| PD | N.N. |  |  |  |  |  |  |  |  |  |
|   | **N.N.** |  |  |  |  |  |  | 0.0 |
| GR | BOETTCHER, JAKOB | 2.2.3 PnF Online | SLOP Filter + Trigger |  | 0.10 |  |  |  |  | 0.10 |
|  |  | 2.5.2. Simulation Software | Monopole Noise Simulation Tool |  |  |  |  | 0.20 |  | 0.20 |
|  |  | 2.2.3. Online Filter | Final level diffuse tests |  | 0.05 |  |  |  |  | 0.05 |
|  | PHILLIPPEN, SASKIA | 2.4.1 Offline Data Production | Moon Sample Processing and Verification |  |  |  | 0.10 |  |  | 0.10 |
|  | 2.6.1. Detector Calibration | Geometry Calibration |  |  |  |  |  | 0.10 | 0.10 |
|  | Schumacher, Lisa | 2.5.4 Science Support tools | Skylab maintenance |  |  |  |  | 0.05 |  | 0.05 |
|  | 2.4.1. Offline Data Production | HE muondata for IC/Auger/TA coinc. analyses |  |  |  | 0.10 |  |  | 0.10 |
|  | Schaufel, Merlin  | 2.1.2 Engineering & R&D support | IceAct Hardware R&D | 0.20 |  |  |  |  |  | 0.20 |
|  | 2.5.2 Simulation Software | IceAct/IceCube/IceTop MonteCarlo |  |  |  |  | 0.10 |  | 0.10 |
|  | 2.6.1 Detector Calibraton | IceTop & IceCube Calibration with IceAct |  |  |  |  |  | 0.10 | 0.10 |
|  | 2.2.6 Surface detectors | IceAct Monitoring |  | 0.10 |  |  |  |  | 0.10 |
|  | Stettner, Jöran | 2.5.4 Science Support tools | NNMFIT tool for diffuse profile likelihood fits  |  |  |  |  | 0.05 |  | 0.05 |
|  | 2.4.3 Public data products | Millipede scans for HE muondata for IC/Auger/TA coinc. analyses |  |  |  | 0.05 |  |  | 0.05 |
|  | 2.4.2 Simulation Production | Simulation production for consistent MC spanning IC-79-IC-86-5 (relevant after pass 2 is completed) |  |  |  | 0.20 |  |  | 0.20 |
|  | 2.4.1. Offline Data Production | Diffuse sample production |  |  |  | 0.05 |  |  | 0.05 |
|  | 2.4.1 Offline Data Production | Diffuse-sample for PS analyses |  |  |  | 0.05 |  |  | 0.05 |
|  | 2.3.4. Distributed Computing Resources | OSG Site RWTH |  |  | 0.05 |  |  |  | 0.10 |
|  | Erik Ganster | 2.3.5.Simulation production | MC Production for global diffuse fit |  |  |  |  |  | 0.20 | 0.20 |
|  | 2.5.4 Science Support tools | NNMFIT tool for diffuse profile likelihood fits  |  |  |  |  | 0.05 |  | 0.05 |
|  | 2.5.2. Simulation Software | Snowstorm MC |  |  |  |  |  | 0.2 | 0.2 |
|  | 2.2.3. Online Filter | Final level diffuse tests |  | 0.05 |  |  |  |  | 0.05 |
|  | Lasse Halve | 2.2.4. Detector Monitoring | Detector monitoring shifts contact from Aachen  | 0.05 |  |  |  |  |  | 0.05 |
|  | 2.1.4 Education & Outreach | Netzwerk Teilchenwelt | 0.05 |  |  |  |  |  | 0.05 |
|  | GR | Detector Monitoring | Detector monitoring shifts |  | 0.12 |  |  |  |  | 0.12 |
|  | **GR Total** |  |  | **0.30** | **0.42** | **0.05** | **0.55** | **0.45** | **0.60** | **2.37** |
|  | **RWTH Total:** |  |  | **0.40** | **0.42** | **0.05** | **0.55** | **0.45** | **0.60** | **2.47** |

**IceCube Upgrade**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | WBS 1.1 | WBS 1.2 | WBS 1.3 | WBS 1.4 | WBS 1.5 | WBS 1.6 | **Grand Total** |
| Project Office | Gen2 enhanced hot water drill | DeepIce Sensor Modules | Comms Power Timing (CPT) | Charcterization and Calibration | M&O data Systems Integration |
| KE | WIEBUSCH, CHRISTOPHER | 2.1.1. Administration | Acoustic devices coordination | 0.10 |  |  |  |  |  | 0.10 |
|  |  | 2.1.1. Administration | mDOM PMT testing coordination | 0.10 |  |  |  |  |  | 0.10 |
|   | **WIEBUSCH, CHRISTOPHER Total** |  | **0.20** |  |  |  |  |  | **0.20** |
| PD |  |  |  |  |  |  |  |  |  |  |
|   |  |  |  |  |  |  |  |  |
| GR | Halve, Lasse | 1.3.1. mDOM | PMT aceptance tests(mDOM) |  |  | 0.50 |  |  |  | 0.50 |
|  |  |  |  |  |  |  |  |  |  |
|  | Zierke, Simon | 1.3.3. pDOM | Acoustic receivers |  |  | 0.05 |  |  |  | 0.05 |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Heinen, Dirk | 1.5.3 array calibration | Acoustc calibration system |  |  | 0.05 |  |  |  | 0.05 |
|  | Weinstock, Lars | 1.3.5 Special devices | Acoustic Pingers |  |  | 0.30 |  |  |  | 0.30 |
|  | **GR Total** |  |  |  |  | **0.90** |  | **0.30** |  | **1.20** |
|  | **RWTH Total:** |  |  | **0.20** |  | **0.90** |  | **0.30** |  | **1.40** |

**Master Students M&O Contribution:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 |
| Master |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| DHARANI, Sukeerti, Jakob | 2.4.2. Simulation Production | Monopole Simulation |  |  |  | 0.10 |  |  | 0.10 |
| Merz, Johannes | 2.4.1 Offline Data Production | Moon Sample Processing |  |  |  | 0.10 |  |  | 0.10 |
| 2.4.2 Simulation Production | Moon Filter Monte Carlo |  |  |  | 0.10 |  |  | 0.10 |
| Hauser, Simon  | 2.4.1 Offline Data production | Processing of AIRS Temperature data |  |  |  | 0.10 |  |  | 0.10 |
|  | POPOVYCH, Yuriy | 2.1.2 Engineering & R&D support | IceAct DAQ and Camera | 0.10 |  |  |  |  |  | 0.10 |
|  | TISCHBEIN, Franziska | 2.4.2 Simulation Production | IceAct Electronic Monte Carlo  |  |  |  | 0.10 |  |  | 0.10 |
|  | **Master Students Total** |  | **0.10** |  |  | **0.50** |  |  | **0.60** |

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| **Labor Cat.** | **Names** | **WBS L3** | **Tasks** | WBS 1.1 | WBS 1.2 | WBS 1.3 | WBS 1.4 | WBS 1.5 | WBS 1.6 | **Grand Total** |
| Project Office | Gen2 enhanced hot water drill | DeepIce Sensor Modules | Comms Power Timing (CPT) | Charcterization and Calibration | M&O data Systems Integration |
| Master | SCHARF, Max | 1.3.5 Special devices | Acoustic Pingers |  |  | 0.20 |  |  |  | 0.20 |
|  | KELLERMANN, Moritz | 1.3.3. pDOM | Acoustic receivers |  |  | 0.20 |  |  |  | 0.20 |
|  | **Master Students Total** |  |  |  | **0.40** |  |  |  | **0.40** |

**Faculty:**

Christopher Wiebusch

**Scientists and Post Docs:**

Presently none

**Ph.D. Students:**

Lisa Schumacher Auger,TA,IceCube Correlation and angular correlation analysis

Jöran Stettner Multi year diffuse analysis

Merlin Schaufel IceAct

Lasse Halve mDOM (PMTs) & Nu nubar flux measurement

Erik Ganster Global Diffuse Analysis (tbd)

Jakob Boettcher Atmospheric neutrinos, diffuse analysis, monopoles

Saskia Philippen Geometry calibration, Moon, t.b.d.

**Non-signing Scientists/Engineers**

 Dirk Heinen Acoustic Calibration System
 Simon Zierke Acoustic Calibration System

 Lars Weinstock Acoustic Calibration System

 Jürgen Borowka Acoustic Calibration System

**Diploma/Master Students**

Moritz Kellermann Acoustic receivers

Philipp Fuerst Diffuse Analysis

Sukee Dharani SLOP monopoles

Simon Hauser Seasonal variations atmospheric neutrinos

Yuriy Popovych IceAct

Max Scharf Acoustic Module

Franziska Tischbein IceAct

**Computing Resources**

|  |  |  |
| --- | --- | --- |
|  | **2020** |  |
|  | **CPU Cluster** | **GPU Cluster** | **Dedicated GPU Mashine** |
| Pledged resources in the IceCube common cluster | ~28800  (shared resources) |  1200 CPU cores and 100 GPUs (shared resources) | 2 (dedicated resources) |

CPU Cluster:  NEC HPC1812Rg-2 Intel Broadwell EP E5-2650v4 @ 2.2GHz, Intel HNS2600BPB Intel Skylake Platinum 8160 @ 2.1 GHz

GPU Cluster: Supermicro 1029GQ-TVRT-01  Intel Skylake Platinum 8160@2.1  2x Tesla V100, NEC HPC1812Rg-2 Intel Broadwell EP E5-2650v4@2.2GHz 2x Tesla P100

Dedicated Mashine: NEC GPS 12G4Rg-1, 2 x Tesla P100, CPU E5-2650v4 @ 2.2 GHz