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

**Scope of Work**

**RWTH Aachen**

**Christopher Wiebusch**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads Master): **2** (1 1 11 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 | Administration | PubCom member | 0.10 |  |  |  |  |  | 0.10 |
|   | **WIEBUSCH, CHRISTOPHER Total** |  | **0.10** |  |  |  |  |  | **0.10** |
| PD | AUFFENBERG, JAN | Surface Detectors  | IceAct coordination | 0.30 |  |  |  |  |  | 0.30 |
| Surface Detectors | IceAct/Skycam Datataking Maintenance |  | 0.20 |  |  |  |  | 0.20 |
|   | **AUFFENBERG, JAN Total** | **0.30** | **0.20** |  |  |  |  | **0.50** |
| GR | HAACK, CHRISTIAN | Simulation Software | Seasonal Weights for NeutrinoFlux module Flux  |  |  |  |  | 0.05 |  | 0.05 |
|  | Reconstruction | Energy reco with machine learning. |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Reconstruction  | NNMFIT tool for diffuse profile likelihood fits -> |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Offline Data Production | Pass2 verification Muon L3 and diffuse WG |  |  |  | 0.05 |  |  | 0.05 |
|  |  | Offline Data Production | Diffuse sample production |  |  |  | 0.10 |  |  | 0.10 |
|  | REIMAN, RENE | Distributed Computing Resources | Grid Operations Team |  |  | 0.20 |  |  |  | 0.20 |
|  |  | Offline Data Production | Diffuse-sample for PS analyses |  |  |  | 0.10 |  |  | 0.10 |
|  | RONGEN, MARTIN | Ice Properties | Hole Ice & bulk ice calibration |  |  |  |  |  | 0.30 | 0.30 |
|  | Detector Calibration | DOM Calibration and R&D |  |  |  |  |  | 0.20 | 0.20 |
|  | Surface Detectors | IceAct calibration/maintenance |  |  |  |  |  | 0.20 | 0.20 |
|  | LEUERMANN, MARTIN | Reconstruction  | Development and Maintenance of PegLeg |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Reconstruction | Co maintenance of OscFit and implementation of extensions (e.g. KDE, systematic fits, baseline correction)  |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Reconstruction | KDE Tools to produce adaptive weighted KDEs, used in OscFit and NuMuFit  |  |  |  |  | 0.10 |  | 0.10 |
|  | Schumacher, Lisa | Simulation Software | Skylab maintenance |  |  |  |  | 0.10 |  | 0.10 |
|  | Offline Data Production | Providing HE muondata for the IC/Auger/TA coincident analyses |  |  |  | 0.05 |  |  | 0.05 |
|  | Schaufel, Merlin  | Detector Calibraton | IceAct Hardware R&D |  |  |  |  |  | 0.10 | 0.10 |
|  | Simulation Production | IceAct/IceCube/IceTop MonteCarlo |  |  |  | 0.10 |  |  | 0.10 |
|  | Surface detectors | IceAct Monitoring |  | 0.20 |  |  |  |  | 0.20 |
|  | Stettner, Jöran | Software | NNM-Fit tool for diffuse profile likelihood fits  |  |  |  |  | 0.10 |  | 0.10 |
|  | Reconstruction | Energy reco with machine learning.  |  |  |  |  | 0.10 |  | 0.10 |
|  | Simulation Production | Simulation production for consistent MC spanning IC-59-IC-86-5 (relevant after pass 2 is completed) |  |  |  | 0.05 |  |  | 0.05 |
|  | Offline Data Production | Diffuse sample production |  |  |  | 0.05 |  |  | 0.05 |
|  | Software | Diffuse Model Repository |  |  |  |  | 0.10 |  | 0.10 |
|  | Erik Ganster | Calibration | IceAct IceCube coincidences |  |  |  |  |  | 0.20 | 0.20 |
|  | Lasse Halve | Calibration | PMT tests for mDOM |  |  |  |  |  | 0.20 | 0.20 |
|  | Detector Monitoring | Detector monitoring shifts contact from Aachen  | 0.05 |  |  |  |  |  | 0.05 |
|  | GR | Detector Monitoring | Detector monitoring shifts |  | 0.12 |  |  |  |  | 0.12 |
|  | **GR Total** |  |  | **0.05** | **0.32** | **0.20** | **0.50** | **0.95** | **1.20** | **3.22** |
|  | **RWTH Total:** |  |  | **0.45** | **0.52** | **0.20** | **0.50** | **0.95** | **1.20** | **3.82** |

**Diplom/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 | Pascal Bacckes | Surface Detectors | IceAct Simulation |  |  |  | 0.20 |  |  | 0.20 |
| Maurice Günder | Surface Detectors | IceAct/IceCube/IceTop MonteCarlo |  |  |  | 0.20 |  |  | 0.20 |
|  | Roxanne Turcotte | Calibration |  Position calibration |  |  |  |  |  | 0.20 | 0.20 |
|  | **Master Students Total** |  |  |  |  | **0.40** |  | **0.20** | **0.60** |

**Faculty:**

Christopher Wiebusch

**Scientists and Post Docs:**

Jan Auffenberg - High energy surface extension, (IceVeto, IceAct).

**Ph.D. Students:**

Marius Wallraff Thesis topic: Sterile neutrinos (still writing)

Larissa Paul Thesis topic RASTA (hibernating)

Rene Reimann Thesis topic : Cosmic neutrino sources

Martin Leuermann Thesis topic: Neutrino mass hierarchy analysis with DeepCore (submitted)

Martin Rongen IceCube Gen2 R&D, Calibration, Thesis Topic: Calibration

Christian Haack Thesis Topic: Cosmic neutrino sources, Galactic Plane

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

Jöran Stettner Multi year diffuse analysis and dark matter decay

Merlin Schaufel IceAct

Lasse Halve mDOM (tbd) & Nu nubar flux measurement

Erik Ganster Diffuse Analysis (tbd) & IceAct-7 Analysis

**Diploma/Master Students**

Pascal Backes IceAct Simulation of Xmax measurement

Maurice Günder IceAct-61 Performance, Data MonteCarlo agreement

Roxanne Turcotte Acoustic positioning for mDOMs

**Computing Resources**

|  |  |  |
| --- | --- | --- |
|  | **2017** | **2018** |
|  | **CPU Cores**  | **GPU Cards** | **CPU Cores** | **GPU Cards** |
| Pledged resources in the IceCube common cluster | ~27700 (shared resources) | 58 (shared resources) | ~27700 (shared resources) | 44 (shared resources) |

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

GPU Cards: NEC HPC1812RG-7, 1 x Tesla P100 , CPU E7-8860v4 @ 2.2 GHz

GPU Cards: Bullx R425-E2, 2 x NVIDIA Quadro 6000, CPU: X5650 @ 2.67 GHz

CPU Cores: X5675 @ 3.0GHz and X7550 @ 2.0GHz and E5-2650v4 @ 2.2 GHz