**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 10 6)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | ExecCom member | 0.20 |  |  |  |  |  | 0.20 |
|  | Administration | PubCom member | 0.10 |  |  |  |  |  | 0.10 |
|   | **WIEBUSCH, CHRISTOPHER Total** |  | **0.30** |  |  |  |  |  | **0.30** |
|  | AUFFENBERG, JAN | Surface Detectors  | IceAct coordination/Analysis |  | 0.30 |  |  |  |  | 0.30 |
| Engineering and R&D Support | Surface detectors Performance & Simulation **(Gen-2)** | 0.10  |  |  |  |  |  | 0.10 |
|   | **AUFFENBERG, JAN Total** | **0.10** | **0.30** |  |  |  |  | **0.40** |
| GR | HAACK, CHRISTIAN | Simulation Software | Maintenance / Addition of seasons weights to nuflux module |  |  |  |  | 0.05 |  | 0.05 |
|  | Simulation Production | Simulation production on cluster/grid for consistent MC spanning IC-59-IC-86-5 |  |  |  | 0.30 |  |  | 0.30 |
|  | Reconstruction | Energy reco with machine learning |  |  |  |  | 0.10 |  | 0.10 |
|  |  | Reconstruction  | Diffuse fit tool |  |  |  |  | 0.20 |  | 0.20 |
|  | Leif, Rädel | Surface Detectors  | IceAct data stream/commissioning  |  | 0.10 |  |  |  |  | 0.10 |
|  |  | Online Filter (Pnf) | L3 IC86-x muon data stream, Scripts & Monitoring |  |  |  | 0.10 |  |  | 0.10 |
|  | SCHOENEN, SEBASTIAN | Simulation Software | KDE Tools KDE and multi-llh |  |  |  | 0.10 |  |  | 0.10 |
|  |  | Reconstruction  | Diffuse fit tool |  |  |  |  | 0.10 |  | 0.10 |
|  | REIMAN, RENE | Simulation Production | AC-RZ GPU/CPU cluster maintenance. iceprod and mass production |  |  | 0.30 |  |  |  | 0.30 |
|  |  | Reconstruction | Point-source search methods/comparison of diffuse and ps samples |  |  |  |  | 0.20 |  | 0.20 |
|  | RONGEN, MARTIN | Ice Properties | Hole Ice calibration |  |  |  |  |  | 0.20 | 0.20 |
|  | Detector Calibration | DOM Calibration and R&D |  |  |  |  |  | 0.10 | 0.10 |
|  | Surface Detectors | IceAct calibration/maintenance |  |  |  |  |  | 0.20 | 0.20 |
|  | Detector Monitoring | Detector monitoring shifts |  | 0.05 |  |  |  |  | 0.05 |
|  | LEUERMANN, MARTIN | Reconstruction  | PegLeg Reconstruction |  |  |  |  | 0.30 |  | 0.30 |
|  |  | Reconstruction | OscFit extension |  |  |  |  | 0.20 |  | 0.20 |
|  | Schumacher, Lisa |  | TBD (DeepLearning) |  |  |  |  |  |  | 0.00 |
|  | GR | Detector Monitoring |  |  | 0.12 |  |  |  |  | 0.12 |
|  | **GR Total** |  |  |  | **0.27** | **0.30** | **0.50** | **1.15** | **0.50** | **2.72** |
|  | **RWTH Total:** |  |  | **0.40** | **0.57** | **0.30** | **0.50** | **1.15** | **0.50** | **3.42** |

**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 | Aatif Waza | Surface Detectors | IceAct Simulation |  | 0.05 |  |  |  |  |  |
| Stefan Wickmann | Engineering and R&D Support | Development acoustic positioning sensors **(Gen2)** | 0.10 |  |  |  |  |  |  |
| Theo Glauch | Reconstruction | Multipole Korrelation analysis methods |  |  |  | 0.05 |  |  |  |
| Merlin Schaufel | Engineering and R&D Support | IceAct DAQ |  | 0.05 |  |  |  |  |  |
|  | Erik Vogel | Reconstruction | Calculation of resolution estimators for PS analysis |  |  |  | 0.1 |  |  |  |
|  | Jöran Stettner | Reconstruction | DM profile for diffuse fit |  |  |  |  | 0.05 |  |  |
|  | **Diploma/Master Students Total** |  | **0.10** | **0.10** |  | **0.15** | **0.05** |  | **0.40** |

**Note: Gen-2 contributions not relevant for IceCube M&O are highlighted in blue** (Total: 0.20 FTE)

**Faculty:**

Christopher Wiebusch

**Scientists and Post Docs:**

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

**Ph.D. Students:**

Marius Wallraff Thesis topic: Sterile neutrinos

Markus Vehring Thesis topic: Atm. Neutrino oscillations

Larissa Paul Thesis topic RASTA

Leif Rädel Thesis topic: Multi year diffuse muon neutrino analysis

Sebastian Schoenen Mag.Monopole Thesis topic: Multi year muon neutrino diffuse analysis

Rene Reimann Multipole analysis, Thesis topic : Cosmic neutrino sources

Martin Leuermann Ang.Korrelation, Thesis topic: Neutrino mass hierarchy analysis with DeepCore

Martin Rongen IceCube Gen2 R&D, Thesis Topic: Gen 2 DOMs, Calibration

Christian Haack IceCube-gen2. Thesis Topic: Cosmic neutrino sources, Galactic Plane

Lisa Schumacher t.b.d. and angular correlation analysis

**Diploma/Master Students**

Stefan Wickmann Acoustic transducers for Gen 2 doms

Jöran Stettner Large scale diffuse fit for dark matter

Eric Vogel Point source fits

Theo Glauch Angular correlation analysis

Merlin Schaufel

Aatif Waza IceAct Simulation

**Computing Resources**

|  |  |  |
| --- | --- | --- |
|  | **2016** | **2017** |
|  | **CPU Cores**  | **GPU Cards** | **CPU Cores** | **GPU Cards** |
| **IceCube**  | ~27700 (shared resources, guaranteed 0.3% usage) | 58 (shared resources, 50% usage) | ~27700 (shared resources) | 58 (shared resources) |
| **PINGU** | --- | --- | --- | --- |
| **Gen2**  | Same as for IceCube | Same as for IceCube | Same as for IceCube | Same as for IceCube |

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

CPU Cores: X5675 @ 3.0GHz and X7550 @ 2.0GHz

New GPU cluster under construction, t.b.d., At least additional 8 GPU for the collabotation