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

**Scope of Work**

**Universität Bonn**

**Marek Kowalski**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads): **2** (1 1 5)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 |
| KE | KOWALSKI, MAREK | Simulation | Simulation tools |   |   |   |  |  0.05 | 0.05 |
|   | **KOWALSKI, MAREK Total** |  |  |  |  |  | **0.05** | **0.05** |
| PO | Böser Sebastian | Detector Monitoring  | Monitoring development |   |  0.20 |   |   |  | 0.20 |
|  |  | Engineering And R&D Support | R&D and software coordinator |  0.20 |   |   |  |  | 0.20 |
|   | **Böser Sebastian Total** |  | **0.20** | **0.20** |  |  |  | **0.40** |
| GR | VOGE, MARKUS | Physics Filters | Online L2 Filter |   |  |  | 0.20  |  | 0.20 |
|   |  | Reconstruction/ Analysis tools | Reconstruction/  |  |   |   |  |  0.10 | 0.10 |
|   | **VOGE, MARKUS Total** |  |  |  |  | **0.20** | **0.10** | **0.30** |
|  | STASIK, ALEXANDER | Physics Filters | Alert System for follow-up |   |   |   | 0.20 |   | 0.20 |
|   | **STASIK, ALEXANDER Total** |  |  |  |  | **0.20** |  | **0.20** |
|   | USNER, MARCEL | Reconstruction Tools | Reconstruction/ Analysis tools |  |   |   |  |  0.20 | 0.20 |
|   | **USNER, MARCEL Total** |  |  |  |  |  | **0.20** | **0.20** |
|   | UBONN GR | Detector Monitoring | Detector Monitoring |   | 0.05 |   |   |   | 0.05 |
|   |   | Reconstruction/ Analysis tools | Reconstruction/ Analysis tools |   |   |   |   | 0.20 | 0.20 |
|   | **UBONN GR Total** |  |  | **0.05** |  |  | **0.20** | **0.25** |
| **UBONN Total** |  |  | **0.20** | **0.25** |  | **0.40** | **0.55** | **1.40** |

**Faculty:**

Marek Kowalski – involved in supervision and high energy cross-section calculation

**Post Docs:**

Sebastian Böser – Monitoring development, PINGU R&D and software coordinator

**Ph.D. Students:**

Markus Voge – Online L2 Filter

 Thesis/Analysis topics: optical follow-up

Andreas Homeier – Optimization and operation of optical follow-up

 Thesis/Analysis topics: X-ray follow-up

Marcel Usner – Particle reconstruction and identification software

 Thesis/Analysis topics: tau neutrino detection

Lukas Schulte – PINGU neutrino mass hierarchy sensitivity

 Thesis/Analysis topics: PINGU sensitivity and prototype sensor

Alexander Stasik – Operation of online system

 Thesis/Analysis topics: Search for high energy emission from

**Diploma/Master Students:**

 Dustin Hebecker (development of a wavelength shifting light sensor)

 Thomas Erhardt (PINGU event reconstruction)

 Nora-Linn Strothjohann (SN neutrino analyses)

 Yunlin Liu (Tau neutrino event reconstruction)

***Resource contribution to Computing by the Bonn IceCube Group and the University***

The operation of the computing cluster includes:

1. High quality Computing Space, cooling, power & network (provided by Physics Institute)
2. System administration (.3 FTE sys-admin)

*1 Computing Space, cooling and power & Networking*

***The Physics Institute provides high quality space, cooling and power.*** The IceCube group is provided with space locally in the PI, that is dedicated and well suited for intensive research computing (i.e. high-bandwidth connections & cooling facilities are available). The facility is currently hosting the 800-node cluster of the ATLAS groups. The University carries electricity costs that arise due to operation of the cluster.

*2. System administration*

***The Bonn University provides 17kEuro per year in funding.*** The system administration for the computing cluster will be approximately .3 FTE, financed through IceCube start-up funds obtained from the University (i.e. 17.000 kEuro per year for 3 years). The administration of the cluster will be a joined effort with the ATLAS-HEP groups at the PI (joined effort is 1 FTE). If there is need for further system administration it will be provided from within the IceCube group.