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

**Scope of Work**

**KIT – Karlsruhe Institute of Technology**

**Andreas Haungs**

**Ph.D Scientists** (2 Faculty 5 Scientist/Post Doc 1 researcher 3 Grads): **6** (2 4 1 3)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Labor Cat.** | **Names** | **WBS Level 3** | **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 | Andreas Haungs | Administration | Coordination | 0.10 |  |  |  |  |  | 0.10 |
|  | Surface Detector | Co-task leader scintillators |  | 0.10 |  |  |  |  | 0.10 |
| **HAUNGS, ANDREAS Total** | |  | **0.10** | **0.10** |  |  |  |  | **0.20** |
| Ralph Engel | Administration | Coordination | 0.10 |  |  |  |  |  | 0.10 |
| **ENGEL, RALPH** **Total** | |  | **0.10** |  |  |  |  |  | **0.10** |
| SC | Harald Schieler | Surface Detector | Construction (scintillator) |  | 0.10 |  |  |  |  | 0.10 |
| **SCHIELER, HARALD Total** | |  |  | **0.10** |  |  |  |  | **0.10** |
| Donghwa Kang | Computing & Data management | Middleware Setup |  |  | 0.15 |  |  |  | 0.15 |
| Simulation production | Surface simulations |  |  |  | 0.15 |  |  | 0.15 |
| **KANG, DONGHWA Total** | |  |  |  | **0.15** | **0.15** |  |  | **0.30** |
| SC (not graduated) | Weindl | Surface Detector Operations | DAQ surface |  | 0.30 |  |  |  |  | 0.30 |
|  |  | Simulation Software | Software surface |  |  |  |  | 0.15 |  | 0.15 |
|  | **WEINDL, ANDREAS Total** | |  |  | **0.30** |  |  | **0.15** |  | **0.45** |
| PO | Agnieszka Lesczcynska | Simulation Production, Software | Validation and Monitoring data sets |  |  |  | 0.20 |  |  | 0.20 |
|  | **LESCZCYNSKA, AGNIESZKA Total** | |  |  |  |  | **0.20** |  |  | **0.20** |
| PO | Hrvoje Dujmovic | Surface Detector Operations | Radio operation |  | 0.30 |  |  |  |  | 0.30 |
|  | **DUJMOVIC, HRVOJE Total** | |  |  | **0.30** |  |  |  |  | **0.30** |
| PO | Thomas Huber | Surface Detector Operations | Scintillator operation |  | 0.30 |  |  |  |  | 0.30 |
|  | **HUBER, THOMAS Total** | |  |  | **0.30** |  |  |  |  | **0.30** |
| GR | Paras Koundal | Surface Detector | Scintillator operation |  |  |  |  | 0.20 |  | 0.20 |
|  | Marie Oehler | Surface Detector | Scintillator operation |  | 0.20 |  |  |  |  | 0.20 |
|  | Roxanne Turcotte | Surface Detector | Radio operation |  | 0.20 |  |  |  |  | 0.20 |
|  | **GR Total** | |  |  | **0.40** |  |  | **0.20** |  | **0.60** |
| **KIT Total** | | |  | **0.20** | **1.50** | **0.15** | **0.35** | **0.35** |  | **2.55** |

**Upgrade:**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 |
| SC | Schieler, Harald | 1.3.1 mDOM | PMT characterization | Inst. In-Kind |  |  | 0.20 |  |  |  | 0.20 |
|  | **Schieler, Harald Total** | |  |  |  |  | **0.20** |  |  |  | **0.20** |
| **KIT Total** | | |  |  |  |  |  |  |  |  | **0.20** |

**Faculty:**

HAUNGS Enhancement of surface array, cosmic ray analysis, R&D for Gen2

Co-task leader ‘Scintillators’

ENGEL Multi-Messenger Physics with IceCube

**Scientists and Post Docs:**

SCHIELER Coordination of Hardware Contribution at KIT and DAQ systems; PMTs for mDOM

KANG Surface analysis (cosmic ray composition, gamma ray search); cosmic ray simulations

LESCZCYNSKA Surface and Veto physics; data analysis; reconstruction software development; simulations (from June 2020)

DUJMOVIC Postdoc ERC, surface radio array

HUBER Surface Scintillator array, operation and calibration (from July 2020)

**Scientists (non-graduated)**

WEINDL DAQ systems (IceTaxi, Radio enhancement) Software development, Detector and data monitoring

**Grad Students:**

KOUNDAL Surface Data reconstruction

OEHLER Development of hybrid surface array, hard- and software

TURCOTTE PhD ERC – Ice Surface Radio

**Computing Resources**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2020** | | **2021** | |
|  | **CPU Cores** | **GPU Cards** | **CPU Cores** | **GPU Cards** |
| Pledged resources in the IceCube common cluster  (local and shared with Auger group) | 200 cores | 2x2 NVIDIA TESLA V100 32GB | Evaluated in summer 2019 | Evaluated in summer 2019 |
| Access to GridKA (Tier 1) & large-scale BW- cluster | 200-300 cores | matter of negotiation | 400 cores | matter of negotiation |