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

**Scope of Work**

**Chiba University**

**Shigeru Yoshida**

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

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | YOSHIDA, SHIGERU | Reconstruction/ Analysis tools | Maintain Romeo, EHE Simulations, Calibration using Standard Candles |   |   |   |   | 0.20 | 0.20 |
|   | **YOSHIDA,SHIGERU Total** |  |  |  |  |  | **0.20** | **0.20** |
| SC | KEIICHI MASE | Reconstruction/ Analysis tools | Maintain Romeo, EHE Simulations, Maintain reconstruction projects (Portia), MC/Data comparison for EHE-filtered and IceTop events, Standard Candle Analysis |   |   |   |   | 0.20 | 0.20 |
|   | **KEIICHI MASE Total** |  |  |  |  |  | **0.20** | **0.20** |
| SC | ISHIHAR, AYA | Physics Filters | diffuse WG co-chair |  |  |  | 0.25 |  | 0.25 |
|  |  | EHE filter  |  |  |  | 0.15 |  | 0.15 |
|   | **ISHIHARA, AYA Total** |  |  |  |  | **0.40** |  | **0.40** |
|   | CHIBA GR | Detector Monitoring | Detector Monitoring |   | 0.03 |   |   |   | 0.03 |
|   |   | Reconstruction/ Analysis tools | Improve the Ice Model, Afterpulse Simulator, Standard Candle Analysis, Maintain reconstruction projects (Ophelia, ehe-star) |   |   |   |   | 0.20 | 0.20 |
|   | **CHIBA GR Total** |  |  | **0.03** |  |  | **0.20** | **0.23** |
| **CHIBA Total** |  |  |  | **0.03** |  | **0.40** | **0.60** | **1.03** |

Chiba was responsible for the PMT and EHE simulation programs and many of our service tasks are related to these business. The detector simulation project, Romeo, which is also responsible for the DOM’s acceptance calculation to be implemented in the Photonics, is maintained by our group (**S. Yoshida, K. Mase**) who includes one of the original authors of Romeo (**S. Yoshida**).

The detector calibration using the standard candle has also been on our priority to provide the collaboration with some key knowledge of our detector response. We (K.Mase/S.Yoshida) maintain this activity to have better understanding of the DOM response and the ice propaties.

Our other service activities include co-chair of diffuse-atmos WG, charge timing extractor module, Portia, (**A. Ishihara**), which is alternative to FeatureExtractor for processing large pulses in DOM. This module has been frequently used in EHE and monopole analysis that must handle extremely luminous events. The EHE simulation framework/meta-project is maintained by **K. Mase** and S. Yoshida, and A. Ishihara.

Chiba also works on EHE filters that contain most energetic population of IceCube events. The filtered data are compared with simulation (**A. Ishihara/S,Yoshida**) for confirming our detector response and its stability to high energy data.

Our analysis efforts are mainly focused in search for extremely-high energy neutrinos. It motivates our activities in EHE + IceTop coincident event analysis. **K.Mase** and the graduate student (**K.Owaku**) are interested in high energy muon bundle characteristics. We hope these efforts will contribute to IceCube cosmic ray physics and also to better modeling of backgrounds that enhances IceCube capability of neutrino signal hunting in wide energy range.

Chiba’s capability for MC data production has been improved. We work on high energy Corsika simulation and Juliet signal simulation. As network bandwidth from Japan to US is limited, we transfer data to Madison by shipping USB disks. **K. Mase and A. Ishihara** maintain this service activity.

**Faculty:**

 Shigeru Yoshida - maintain Romeo and EHE simulations, detector calibration

**Scientists and Post Docs:**

 Keiichi Mase – maintain Romeo and EHE simulation, MC/Data comparison for high-energy events, flasher/Standard candle analysis for detector calibration

 Aya Ishihara – Diffuse WG co-chair, maintain EHE simulation. MC/Data comparison for EHE-filtered and IceTop events, maintain the reconstruction projects (Portia)

**Students:**

 Kohei Owaku - Operation monitoring, the EHE event reconstruction