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

**Scope of Work**

**Yale University**

**Reina Maruyama**

**Ph.D Scientists** (Faculty Scientist/Post Doc Grads): **1** (1 0 1)

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| **Labor Cat.** | **Names** | **WBS Level 3** | **Tasks** | **Funds Source** | **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 | Reina Maruyama | Supernova System | Supernova DAQ | Inst. In-Kind |  | 0.05 | |  | |  | |  | | 0.05 |
|  | Engineering and R&D Support | Gen2 R&D | Inst. In-Kind | 0.05 |  | |  | |  | |  | | 0.05 |
|  | Reconstruction / Analysis Tools | Coincident events between IceCube and DM-Ice, low energy reconstruction | Inst. In-Kind |  |  | |  | |  | | 0.05 | | 0.05 |
|  | **Reina Maruyama Total** | |  |  | **0.05** | **0.05** | |  | |  | | **0.05** | | **0.15** |
| PO | Matthew Kauer | Detector monitoring | Detector monitoring | Inst. In-Kind |  | 0.05 | |  | |  | |  | | 0.05 |
|  | Reconstruction / Analysis Tools | low-energy reconstruction using DM-Ice | Inst. In-Kind |  |  | |  | |  | | 0.05 | | 0.05 |
|  |  | |  |  |  | **0.05** | |  | |  | | **0.05** | | **0.10** |
| GR | Antonia Hubbard | Reconstruction / Analysis Tools | Coincident events between IceCube and DM-Ice, characterization of untriggered IceCube events, low energy reconstruction | Inst. In-Kind |  |  | |  | |  | | 0.50 | | 0.50 |
|  | **Antonia Hubbard Total** | |  |  |  |  | |  | |  | | **0.50** | | **0.50** |
| **Yale Total** | | |  |  | **0.05** | | **0.10** | |  | |  | | **0.60** | **0.75** |

**Faculty:**

Reina Maruyama – Supernova DAQ and Simulation tools, dark matter search, coincidence with DM-Ice

**Scientists and Post Docs:**

Matthew Kauer (paid by UW-Madison & Yale until July 2015, UW-Madison after) – Run coordinator, detector monitoring, low-energy reconstruction

**Grad Students:**

Antonia Hubbard – Development of coincidence searches between IceCube and DM-Ice, characterization of low energy events untriggered in IceCube

Thesis/analysis topics: Backgrounds for DM-Ice: Coincidence Events Between IceCube and DM-Ice

**Overall summary of M&O responsibilities and analysis topics**

The PI at Yale, Reina Maruyama has graduated Benedikt Riedel from UW-Madison who worked on the supernova simulations and daq in Nov. 2014. The postdoc, Matt Kauer, is working 50% as the run coordinator (paid for by UW-Madison) and 50% on DM-Ice (from Yale) until July 2015. He is working with Antonia Hubbard on using DM-Ice/IceCube coincident events to verify and improve IceCube reconstruction. After July, he will be 100% UW-Madison.  Antonia Hubbard (NSF Graduate Fellow, now paid for from Yale) is looking at coincidence events between DM-Ice and IceCube. These coincident events offer opportunities for improving reconstruction, especially for low energy events, as well as threshold studies. The PI plans to continue her work in supernova detection and explore synergies between IceCube and DM-Ice with Yale students and postdocs. Funding to support this work will be sought from NSF and other sources.