

# Far Water Cherenkov Detector Calibration

Interested groups:

Hawaii, ISU, LSU, SDSMT

# High Level Goals

Calibration of (in energy range relevant for beam physics)

1. Energy
  - a) Scale (position)
  - b) resolution (position)
  
2. Particle vertex and ID
  - a) Vertex resolution (position)
  - b) PID efficiency (position)
  
3. PMT + light collectors
  - a) Timing
  - b) Pulse height
  
4. Water transparency monitoring
  - a) Absorption (height, azimuth)
  - b) Scattering (height, azimuth)
  
5. Detector environmental monitoring
  - a) Temperature
  - b) Water Level
  - c) pH
  - d) Dissolved solids
  - e) Resistivity
  - f) Biological activity
  - g) Flow rate + patterns

# Calibration requirements/Simulations

- Baseline calibration requirements are determined from past experience (e.g. SK and similar)
- Refine requirements with simulation studies
  - see task list in section about simulations

# Technical Tasks

## Energy

- Through-going muons → muon telescope
- Stopping muons

# Technical Tasks

## Particle vertex and ID (hardware and software tasks)

- Cherenkov Simulating Light Pulser
- Michel electron sample
- Monte Carlo simulations

# Technical Tasks

## PMT + light collectors

- Central multi-wavelength light source with variable attenuation
- Movable non-central multi-wavelength light source with variable attenuation
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# Technical Tasks

## Water transparency

- External high precision
- Internal real time monitor
- Internal light sources
  - Multi-wavelength LED (see SK)
- Cosmic ray analysis
  - Muon telescope or similar with OD

# Technical Tasks

## Detector environment

- Various sensors
- Water sampling