

# Northern-Auger Working Group

*(Draft written by K. Arisaka on 9/12/03)*

At the Northern-Auger Workshop at FNAL, the following four working groups will be formed:

1. Science Case
2. Detector R&D
3. Detector Simulation & Optimization
4. Site/Coordination

Each working group is expected to achieve the following goals during the workshop.

- Define the most important sub-areas to be addressed for the completion of a full proposal of the Northern Auger.
- Determine the action items and milestones.
- Assign the members of the working group to each action item.
- In particular, define the goal for the November Collaboration meeting at Malargue.
- Select the conveners of the working groups internally (by the afternoon of October 4<sup>th</sup>).
- White up a brief budget request (for group 2 & 4, \$100-200k/group).

Eventually, these working groups will contribute to the actual writing of the full proposal, which is expected around summer of 2004.

## 1. Science Case

This group is expected to identify and develop the strong science case of the Northern Auger. One could imagine that strong science case is given for various topics such as

- Uniform all sky coverage
- More statistics on Super-GZK events
- More statistics on UHE Neutrinos
- Precise study on the origin of extra Galactic Cosmic rays above the Kee.

For better argument, the default detector should be identical to the Southern-Auger. However, various possible scenarios (which have been already discussed) should be addressed. Such scenarios include, but not limited to:

- Extended Outrigger array (say, 2-5 times larger than nominal 3,000km<sup>2</sup>.)
- Ground Array only
- Infill (dense array) for low energy extension

The outcome is expected to be written as a "Science White Paper", whose draft will be presented at the November collaboration meeting.

## 2. Detector R&D

This group is expected to focus on possible improvement of the existing detector hardware (from Southern-Auger), or expected to develop innovative new hardware, which either significantly reduces the cost or significantly improves the scientific performance.

- Better/cheaper design of Water tank
- Better/cheaper design of SDE, COMM, CDAS
- Better/cheaper design of FD/FDE
- Scintillator (MINOS or TA-like)
- Radio detector

As time/budget/manpower are all limited, it is very important to identify a few specific areas which are the most promising. This group will develop a modest budget request (\$100-200k) during the workshop to address the most pressing R&D for the next one year. This budget request will be submitted to NSF/DOE this fall.

## 3. Detector Simulation & Optimization

The science case (addressed by the first working group) must be justified by a doable, cost effective detector design. On this regard, it is extremely useful to develop reliable "scaling laws" between detector parameters/cost and scientific objectives. The detector parameters include, but not limited to

- The total number of SD and their spacing
- Area, height of SD
- Water Tank vs. Scinti
- FD mirror size, pixels size, FOV/pixel etc.

The scientific objectives would include, but not limited to

- Energy Resolution/Threshold
- Angular Resolution and Zenith coverage
- Expected statistics of Super-GZK events
- Sensitivity to UHE neutrinos
- Composition

Based on the result of such studies, the whole collaboration will discuss and decide the final detector configuration (and the total cost). Therefore, earlier release of preliminary results is very important to direct our discussion to the sensible direction.

#### 4. Site/Coordination

To be specific, we are considering two sites: Utah and Colorado. This working group will pursue both cases and address the following critical questions:

- Does the site meet the detector specifications to achieve the scientific objectives? The specs include
  - Total Area for the ground array
  - Air quality
  - FD site location
- Is the access and infrastructure adequate, or easy to develop?
- Is there strong support by local groups (both scientists and politicians)?
- Is it possible to obtain the site permission on a timely manner? Are there any foreseen obstacles (such as environmentalists)?

This group is expected to provide a detailed comparison table to the whole collaboration in a timely manner for the final decision. (Decision date will be discussed at the FNAL workshop.)

If a budget is required for the timely completion of site survey, a modest amount (\$100-200k) can be requested to the funding agencies (i.e. DOE/NSF, together with detector R&D budget.)