

IceCube Collaboration Governance Document

Revision 8.4, November 13, 2015

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Collaboration Objectives

The IceCube Collaboration (the Collaboration) is an organization of scientists who collectively participate in a research program with the IceCube Observatory at the NSF South Pole Amundsen-Scott station. IceCube consists of a surface array, IceTop, and a deep ice array IceCube. Henceforth, IceCube stands for the IceCube Observatory. The primary goal is the study of high-energy neutrinos from cosmic sources, but the program also encompasses a broader array of topics made possible by the IceCube observatory.

Definitions

The Host Institution for the IceCube project is the University of Wisconsin-Madison (UW) with the P.I. defined by the M&O grant to the Host Institution. Responsibilities are defined in the Cooperative Agreement with NSF. The Operations Phase of IceCube is specified as the period when activities are governed by the M&O Cooperative Agreement between UW and the NSF. The Memorandum of Understanding (MoU) governing institutional responsibilities for M&O consists of a single MoU between the host institution and each constituent institution. The International Oversight and Finance Group functions are defined in the Maintenance and Operations Plan (excerpt attached in Appendix D). The organization for the operation of IceCube is shown in the organization chart of Appendix C.

Operation of the IceCube detector is organized within the IceCube Coordination Committee (ICC) chaired by the Associate Director for Science and Instrumentation. The main functions are Detector Maintenance & Operations; Computing and Data Management; Triggering & Filtering; and Data Quality, Simulation & Reconstruction Tools, as shown in the Organization chart. Some key positions in the ICC are appointments of the host institution; most positions are filled by collaboration scientists chosen for their expertise by the Chair of the ICC in consultation with the Spokesperson.

Collaboration Membership

The IceCube Collaboration consists of scientists at Collaboration Constituent Institutions. The condition for membership and for institutional recognition is that the group makes a significant contribution to IceCube. Significant contributions will include a contribution to the common fund proportional to the number of Ph.D. scientists in the group as well as contributions to detector operations and data analysis. The proposed contributions, role in the scientific program, and personnel are to be detailed in the MoU that is updated annually.

Current members of the Collaboration as of the date of revision of this document come from the institutions listed in Appendix A. (This Appendix also lists the initial institutions of IceCube.) Any scientist or group of scientists may apply to the Spokesperson of the Collaboration for membership of their institution in IceCube. Admission of new institutions requires approval by a two-thirds majority of the IceCube Constituent Institutions, under consideration of the proposed contributions and role in the research program. Scientists who join member groups at Institutions that were

members of the Collaboration prior to IceCube completion will automatically be accepted as members of the Collaboration. At all other institutions the addition of new senior personnel will require approval by the IceCube Collaboration Board.

An individual scientist or a group of scientists may be accepted as associate members of IceCube if they are sponsored by an IceCube collaborating institution to work on a specific aspect of analysis and/or service. The arrangement should be clarified in an MoU that describes the subject in which the associate will participate, the term of association and any other details.

Membership of an individual or Institution may be revoked by the Spokesperson for just cause, e.g. actions detrimental to IceCube. A concurring vote by two-thirds of all Constituent Institutions is required. Only active votes will be counted.

Collaboration Board

1. Functions and Responsibilities

The Collaboration Board is the policy-making entity that guides and governs the scientific activities of the Collaboration. It establishes, and as necessary amends, governance procedures and has oversight and authority over:

- science policy and goals
- membership
- data access
- publication
- representation of IceCube at topical and general conferences
- analysis teams
- education and outreach

The Collaboration Board, through the Collaboration Spokesperson, maintains contact and communication with the Director of Operations at the host institution.

It advises the Director on the detector operation for scientific investigations and maintenance, and participates in the discussion, as articulated by the Director of Operations, of the potential or possible use of the IceCube facility as a resource for new initiatives.

The Collaboration Board ratifies the Collaboration Governance document and may introduce amendments to it.

The Collaboration Board ratifies the Cooperative Agreement between the NSF and Host Institution, and may suggest amendments to it.

The Collaboration Board, during the operation phase of IceCube, advises the Director of Operations on selection of personnel that hold key responsibilities for the Maintenance and Operation of the detector.

Concerns of the Collaboration members are addressed to Collaboration Board members who, when appropriate, bring those before the Collaboration Board for its consideration.

At the request of a Board member the Board may require a detailed verbal, or written, report from the Spokesperson on any action.

2. Membership

Each Collaboration Constituent Institution is represented on the Collaboration Board by at most two members of whom one is voting whereas the other is a non-voting adjunct member. The number of votes per institution depends on number of Ph.D. physicists (see for the key section 6 below).

Early Career scientists in the Collaboration are represented by two additional, at-large, members chosen collectively by Early-Career Collaboration participants. The term of service is two years, not renewable, and the terms overlap - i.e. one new representative is elected every year. Election rules for Early Career scientists are given in [Appendix B](#). Of the two members, one is voting whereas the other is a non-voting adjunct member. Information of who is voting should be given to the Spokesperson before each meeting of the Collaboration Board.

During the IceCube operation phase, the P.I. of the M&O grant from NSF (the IceCube P.I.) and the Associate Director for Science are ex-officio members of the Collaboration Board.

3. Officers

The Collaboration Board is chaired by the Collaboration Spokesperson. The Spokesperson is an ex-officio, non-voting member of the Collaboration Board. The Spokesperson is elected by the Ph.D. members of the collaboration. The election procedure is as follows:

- The Spokesperson appoints two Collaboration members who serve as a nomination commission.
- Nominations are sought from the Collaboration at large. Each constituent Institution may offer any number of candidate nominees.
- The nomination commission notifies each nominee that she/he has been proposed. Within two weeks each nominee shall inform the nomination commission if he/she is willing to be listed as a nominee. All who do so, compose the final slate of viable nominees.
- The Spokesperson is chosen by majority vote of all Ph.D. physicists in the Collaboration.
- If none of the candidates gets more than 50% of the votes in the first round the choice between the two names with the most votes is decided in a second round.

Each nominee is urged to prepare a statement that contains her/his assessment of the state of IceCube, goals and plans for action to be taken during his/her tenure as Spokesperson. The text of the statement should accompany the nominee's acceptance notice to the nomination commission who will distribute it with the ballot to the Collaboration membership.

The Spokesperson may select a Deputy Spokesperson. The Board ratifies the choice. The Deputy performs the duties of the Spokesperson when necessary if the Spokesperson is unable to do so. The Deputy is an ex-officio, non-voting member of the Collaboration Board. If the Spokesperson or Deputy is a regular Collaboration Board member, a replacement is chosen by the affected Institution. The period of office of the Spokesperson and the Deputy Spokesperson is two years, renewable - but at most four consecutive years.

The Spokesperson, as Collaboration Executive

- organizes and chairs Collaboration Board meetings
- during the IceCube operations phase is the interface between the collaboration Board and the Director of Operations at the Host Institution, communicating with the Director on behalf of the Collaboration Board.
- arranges general Collaboration meetings
- speaks for the Collaboration in interaction with the scientific community
- speaks for the Collaboration in interaction with the general public
- selects members of Collaboration advisory committees subject to concurrence by Collaboration Board majority vote
- communicates with the International Oversight and Finance Group (see Appendix D) on behalf of the Collaboration Board.
- calls for and oversees formal votes on particular issues

4. Executive Committee

The Spokesperson, in consultation with the Collaboration Board and, with the P.I. and the Director of Operations, appoints and chairs an Executive Committee of the Collaboration Board. The term of the Executive members is two years. The job of the Executive Committee is to advise the Spokesperson in proposing actions to the Collaboration Board and in making interim decisions. The members of the Executive Committee should represent major groups, functions and competences within the Collaboration.

5. Meetings

As a rule, the Collaboration Board meets during general Collaboration meetings. More frequent telephone or video conferences may be called by the Spokesperson, with normally two weeks prior notice having been given Board members. At a minimum, representation of two-thirds of all Constituent Institutions is required to constitute a quorum. The Spokesperson will appoint a secretary to each Collaboration Meeting for writing the minutes. The minutes will include all decisions that were taken. Minutes will be posted on the IceCube private www site within one week following the meeting, following approval by the Collaboration Board members.

6. Voting procedure

In general, matters before the Collaboration Board are settled by consensus of its members. At a meeting of the Collaboration Board, a show of hands will be called for to determine if there is consensus. If there is no consensus, a formal vote will be ordered by the Spokesperson. A formal poll can also be requested by a Collaboration Board member. In both cases, the polling will be done by Email within one week of the meeting. Each institution has one vote weighted by a factor depending on the number of affiliated PhD physicists. The weight is equal to the square root of the number of PhD physicists, rounded to the nearest integer. The weights are fixed once per year. In case of a tie vote, the Spokesperson casts a vote. Only active votes will be counted. Abstentions or absences do not count. Results will be announced to the Collaboration Board by the Spokesperson. All votes will be open, except where persons are concerned. The voting procedure for the Spokesperson is described in section 3.

7. Education and Outreach

The IceCube collaboration collectively and individually participates in and provides support for efforts in public outreach and education on subjects related to its science. The Spokesperson, with Collaboration Board concurrence, responds to requests for information from the media or may take the initiative providing material. The Director of Operations, with Collaboration Board concurrence, appoints a Collaboration member to lead an education program for students and teachers at all levels. The Collaboration maintains coordination and cooperation with other ongoing education initiatives. All new scientific material to be released for purposes of public outreach or education containing other than previously published data or results must have been agreed upon by the Collaboration Board.

8. Collaboration Policies and Procedures

Meetings

Collaboration meetings are held at least two times in a year. Locations are distributed among Collaboration Constituent institutions, chosen by the Spokesperson, and ratified by Board concurrence. The hosting institution is responsible for physical meeting arrangements. Agendas are set by the Spokesperson together with the hosting institution, the Analysis Coordinator, the working group leads and the operations managers (i.e. members of the ICC), with concurrence of the Collaboration Board.

Data Reduction and Analysis

Raw, unfiltered data written to tape at Pole are transported to the UW data center for archival storage unless directed otherwise by the Collaboration Board. Filtered data are transmitted daily via satellite link to the UW data center and stored on disk. Additionally, the filtered data will be copied via internet to DESY and stored on disk as a second official copy.

All current IceCube members have access to archived data. Associate membership in IceCube gives the Associate access to IceCube data and software for the sole purpose of pursuing a particular analysis. The analysis should augment the science that can be done with IceCube alone.

The Collaboration Board consents to the appointment of Collaboration members who have been chosen jointly by the Spokesperson and Director of Operations. These include the Analysis Coordinator and Working Group conveners. The term of service for the Analysis Coordinator and Working Group conveners is two years, renewable. The Analysis Coordinator assumes responsibility for organization and management of data analysis efforts.

It is the intention of the Collaboration to place the data in the public domain as soon as it is reasonable to do so from a scientific point of view (see appendix E). The Collaboration Board shall determine rules for access to the data.

Detector operations and monitoring

The Spokesperson with Collaboration Board concurrence appoints a Collaboration member to organize and lead a group responsible for detector Monitoring, Maintenance and

Calibration. The term of service is one year, renewable. Detector monitoring is a collaboration-wide shared responsibility.

9. Topical and General Conference Presentations

The Spokesperson, with concurrence of the Collaboration Board, appoints a Collaboration member to chair a Speakers Committee. The period of office of the chair is 2 years, renewable – but at most 4 consecutive years. The duration is counted from the day the chair assumes office, independent of possible prior Speakers Committee membership. The designated chairperson chooses three other members of this Speakers Committee. The term of the members of the Speakers Committee is 2 years, renewable – but at most 4 consecutive years. A later re-accession, with the consensus of the chair, is possible after a break of at least 2 years. A rapid decision channel (chair + Spokesperson) can be enabled if there is insufficient time to involve the whole committee. Invitations to present Collaboration results, or performance reviews, are submitted to the Speakers Committee. The Speakers Committee chooses the speaker.

The Speakers Committee maintains records of conference presentations. The conference organization is notified by the Spokesperson of the identity of the nominated speaker and the subject of the talk and its approval is sought.

In order to present previously unreported data and/or results approval must be obtained from the Spokesperson, with Collaboration Board concurrence. The Spokesperson has the right to hold new results in order to approve final text, figures, and tables.

Transcriptions of verbatim reports of approved presentations to be included in conference proceedings are posted on the IceCube www site not later than two weeks before the editorial deadline to allow review, comments and suggestions for revisions by the Collaboration. Such controls do not normally apply to colloquium or seminar talks at members' home or other institutions on personal invitation but the Analysis Coordinator must be made aware of any new results which differ from results already public or might be controversial. For presenting such results Analysis Coordinator approval must be obtained.

Reports in proceedings are normally bylined by a single name (the presenter's) followed by "for the IceCube Collaboration". The complete author list in alphabetic order should if possible be included. Otherwise a reference is made to the complete author list elsewhere. Deviations from this rule are possible on a case by case basis but require justification. Requests are handled by the Publication Committee. The Collaboration Board constructs the author list from compilations provided it by Constituent Institution representatives. Others who have contributed to a particular effort may be included as authors. Individual requests not to be included as authors are acceded to without prejudice. Any Constituent Institution representative may request a variance from the default listing to allow a conference presentation authored by a subset of members and others who have contributed to a particular special (usually technical) subject. A concurring vote by two-thirds of all Constituent Institutions is required for approval. Only active votes will be counted.

10. Publications

The Spokesperson, with concurrence of the Collaboration Board, appoints a Collaboration member to chair a Publications Committee. The period of office of the chair is 2 years,

renewable – but at most 4 consecutive years. The duration is counted from the day the chair assumes office, independent of possible prior Publication Committee membership. The designated chairperson chooses nine other members of this Publications Committee. The term of the members of the Publication Committee is 2 years, renewable – but at most 4 consecutive years. A later re-accession with the consensus of the chair is possible after a break of at least 2 years.

The Publication Committee oversees and coordinates submission of papers and proceedings reports in coordination with the analysis coordinator and the working group leaders as described in Appendix C.

Results are to be submitted for publication in refereed journals. Drafts of research results are prepared by the analysis teams; drafts of papers on technical matters are prepared by the cognizant individuals. The internal review procedure is described in Appendix C. Journal articles are bylined by the full author list in alphabetical order. The Collaboration Board constructs the author list from compilations provided it by Constituent Institution representatives. As a rule collaborators may become authors six months after joining the collaboration. They are normally removed from the list one year after leaving. This period may be extended in special cases of former collaborators who contributed essential effort to the construction of IceCube. Others who have contributed to a particular effort may be included as authors. Individual requests not to be included as authors are acceded to without prejudice. Any Constituent Institution representative may request a variance from the default listing to allow submission of a paper for publication authored by a subset of members and others who have contributed to a particular special (usually technical) subject. A concurring vote by two-thirds of all Constituent Institutions is required for approval. Only active votes will be counted.

Associate members only appear on the author list for the publication(s) directly related to their analysis and agree not to publish independently results based on private IceCube software or data.

11. Ph.D. Research

Research topic assignments are the responsibility of the students and faculty supervisors. Discussions among faculty supervisors and Collaboration Board members are encouraged to avoid serious overlaps in subject matter and/or analysis methodology. The Spokesperson maintains a list of completed and current theses. Texts of theses are posted to the IceCube private www site and may be posted at the institution www site. Titles and author names are posted on the official IceCube www site.

12. Amendments

This document will be reviewed for proposed amendments as necessary. Any member of the collaboration may bring such proposals to the Collaboration Board's attention. Proposed amendments to this charter will be considered during regular meetings of the Collaboration Board. A concurring vote by two-thirds of all Constituent Institutions is necessary to pass an amendment. Only active votes will be counted.

Appendix A: IceCube Institutions

(ordered alphabetically according to location)

a. Initial IceCube Institutions (application 1999 to NSF):

- i. CTSPS, Clark-Atlanta University, Atlanta, USA
- ii. Southern University and A&M College, Baton Rouge, USA
- iii. Lawrence Berkeley National Laboratory, Berkeley, USA
- iv. University of California-Berkeley, Berkeley, USA
- v. Université Libre de Bruxelles, Brussels, Belgium
- vi. University of California-Irvine, Irvine, USA
- vii. University of Kansas, Lawrence, USA
- viii. University of Wisconsin, Madison, USA
- ix. Universität Mainz, Mainz, Germany
- x. Bartol Research Institute, University of Delaware, Newark, USA
- xi. University of Pennsylvania, Philadelphia, USA
- xii. Institute for Advanced Studies, Princeton, USA
- xiii. Stockholm Universitet, Stockholm, Sweden
- xiv. Uppsala Universitet, Uppsala, Sweden
- xv. BUGH Wuppertal, Wuppertal, Germany
- xvi. DESY-Zeuthen, Zeuthen, Germany

b. IceCube Institutions as of September 2015:

- i. III Physikalisches Institut, RWTH Aachen University, Aachen, Germany
- ii. Adelaide School of Chemistry and Physics, University of Adelaide, Adelaide, Australia
- iii. Dept. of Physics and Astronomy, University of Alabama, Tuscaloosa, USA
- iv. Dept. of Physics and Astronomy, University of Alaska Anchorage, Anchorage, USA
- v. CTSPS, Clark-Atlanta University, Atlanta, USA
- vi. School of Physics and Center for Relativistic Astrophysics, Georgia Institute of Technology, Atlanta, USA
- vii. Dept. of Physics, Southern University, Baton Rouge, USA
- viii. Dept. of Physics, University of California, Berkeley, USA
- ix. Lawrence Berkeley National Laboratory, Berkeley, USA
- x. Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany
- xi. Fakultät für Physik & Astronomie, Ruhr-Universität Bochum, Bochum, Germany
- xii. Université Libre de Bruxelles, Brussels, Belgium
- xiii. Vrije Universiteit Brussel, Brussels, Belgium
- xiv. Dept. of Physics, Chiba University, Chiba, Japan
- xv. Dept. of Physics and Astronomy, University of Canterbury, Christchurch, New Zealand
- xvi. Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark
- xvii. Dept. of Physics, University of Maryland, USA
- xviii. Dept. of Physics and Center for Cosmology and Astro-Particle Physics, Ohio State University, Columbus, USA
- xix. Dept. of Physics, TU Dortmund University, Dortmund, Germany
- xx. Particle Physics at Drexel, Drexel University, Philadelphia, PA, USA
- xxi. Dept. of Physics, University of Alberta, Edmonton, Alberta, Canada
- xxii. Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

- xxiii. Dépt. physique nucléaire et corpusculaire, Université de Genève, Geneva, Switzerland
- xxiv. Dept. of Subatomic and Radiation Physics, University of Gent, Gent, Belgium
- xxv. Dept. of Physics and Astronomy, University of California, Irvine, USA
- xxvi. Dept. of Physics and Astronomy, University of Kansas, Lawrence, USA
- xxvii. Dept. of Physics, University of Wisconsin, Madison, USA
- xxviii. Institute of Physics, University of Mainz, Mainz, Germany
- xxix. Department of Physics, Marquette University, Milwaukee, WI, USA
- xxx. Massachusetts Institute of Technology, Cambridge, MA, USA
- xxxi. Université de Mons, Mons, Belgium
- xxxii. Exzellenzcluster Universe, Technische Universität München, Munich, Germany
- xxxiii. Bartol Research Institute and Department of Physics and Astronomy, University of Delaware, Newark, USA
- xxxiv. Department of Physics and Astronomy, Michigan State University, East Lansing, MI, USA
- xxxv. Dept. of Physics, University of Oxford, Oxford, UK
- xxxvi. Dept. of Physics, University of Wisconsin, River Falls, USA
- xxxvii. Dept. of Physics, South Dakota School of Mines and Technology, Rapid City, SD, USA
- xxxviii. Department Of Physics and Astronomy, University of Rochester, Rochester, NY, USA
- xxxix. Dept. of Physics, Sungkyunkwan University (SKKU), Seoul, South Korea
- xl. Oskar Klein Centre and Dept. of Physics, Stockholm University, Stockholm, Sweden
- xli. Dept. of Physics and Astronomy, Stony Brook University, Stony Brook, NY, USA
- xlii. Dept. of Physics, University of Toronto, Toronto, Canada
- xliii. Dept. of Physics, Pennsylvania State University, University Park, USA
- xliv. Dept. of Physics and Astronomy, Uppsala University, Uppsala, Sweden
- xlv. Dept. of Physics, University of Wuppertal, Wuppertal, Germany
- xlvi. Dept. of Physics, Yale University, New Haven, CT, USA
- xlvii. DESY, Zeuthen, Germany

Appendix B: IceCube Early Career Scientist Elections

- a. **Definition of IceCube EC Scientist:** An Early Career scientist is a member of the IceCube collaboration who has received their Ph. D. within 7 years of the most recent past January 1st, but who has not received an assistant professor or tenured position; or who is a graduate student who has been on the author list for two years.
- b. **Election Oversight Committee:** The EC representatives will annually and prior to the elections appoint a committee of two members taken from the entire collaboration, excluding persons eligible, to oversee the election.
- c. **Nominations for EC Representative:** The current year's representatives will solicit nominations collaboration-wide for EC representatives. These nominations will be collected by the members of the oversight committee and posted. Self-nomination is permitted. Only Early Career scientists who have received their Ph. D. can be nominated.
- d. **Voting:** Each EC scientist possesses one vote. The vote is sent to the oversight committee. One is allowed to vote for one's self. Votes are counted privately by the

oversight committee. The person receiving the top vote count will be announced by this committee as the new EC scientist representative. In the event of a tie, a tie-breaking round of voting with the ballot containing just the tie-holders will be held.

Appendix C: IceCube Maintenance, Operations and Data Analysis Plan

This document sets forth the plan for the organization and implementation for M&O and Data Analysis during the operations phase of IceCube.

M&O and Physics Analysis

- Planning Documentation
- Analysis Coordination
- Internal review Process
- Talks

Planning Documentation

Planning documentation is composed of this document in its entirety, which lays out the plan for M&O and data analysis of IceCube data. This plan will be reviewed by the IceCube Director of Operations and the IceCube collaboration and once approved will be implemented. Approval and/or modification requires the data analysis plan to be accepted by:

1. IceCube PI
2. IceCube Collaboration Spokesperson
3. IceCube Director of Operations
4. IceCube Collaboration Board

This document should not conflict with the IceCube collaboration governance document. If there are any conflicts the collaboration governance document takes precedent.

Analysis Coordination

Analysis coordination has two tasks that are:

- Analysis Coordinator
- Working Groups

The analysis coordinator has authority over the working groups as laid out in this document.

Analysis Coordinator

a) Selection of Analysis Coordinator

The procedure for selecting the Analysis Coordinator is by appointment from the Spokesperson with concurrence of the Collaboration Board.

b) Term of Analysis Coordinator

The term of the Analysis coordinator will be two years. The current Analysis Coordinator may be nominated to remain as Analysis Coordinator.

c) Responsibilities of Analysis Coordinator

The responsibilities of the analysis coordinator are the overall organization and oversight of the working groups and physics analysis of the IceCube data. Specifically the Analysis Coordinator will:

1. Have oversight of the physics analysis
2. Aid in defining the physics working groups
3. Aid in selection of working group leaders
4. Have input on internal review processes for publications and talks
5. Have input on the distribution of talks
6. Have oversight of analysis documentation

Working Groups

a) Preliminary list of working groups

Working groups are organized a) according to event topologies and the related filter and reconstruction methods and b) according to physics topics. Topology-driven groups can be, for instance:

1. Muons
2. Cascades
3. Hybrid events
4. ...

with the physics topics such as AGN, GRB, WIMPs etc... as subcategories in each working group with the same physics topic across groups. A possible grouping according to physics topics would be:

1. Diffuse cosmic and atmospheric neutrinos
2. Point Source Searches
3. GRB neutrinos
4. neutrinos from WIMP annihilation
5. Cosmic ray studies
6. Exotic particles like magnetic monopoles or Q-balls
7. MeV neutrinos from Supernova bursts
8. Extremely High Energy Phenomena (EHE)

with detector and reconstruction methods as tools to be developed across different working groups. Definition of groups will be kept dynamically, with the list above representing the 2010 status.

b) Selection of Working Groups & Group Leaders

The Analysis Coordinator will coordinate and implement the analysis effort for the IceCube detector in order for it to accomplish its scientific mission. The analysis coordinator, with input from the entire collaboration, will determine the physics benchmarks and processes

and organize physics working groups to ensure that these processes are measured. The Analysis Coordinator together with the Spokesperson will select the working group leaders with input from the IceCube collaboration and IceCube Director of Operations. The term of office of a working group leader is 2 years, renewable.

c) Responsibilities at Working Group Level

The physics working group leaders have direct responsibility for organizing the individual data analyses of the IceCube detector. They will:

1. Organize their physics working group
2. Define & verify standard datasets for their particular physics processes
3. Verify the operation and performance of the IceCube detector, primarily as it pertains to their physics processes of interest
4. Document the physics analysis and approved results with memos
5. Document analysis tools with memos
6. Place memos on Docushare for collaboration access and maintain the Docushare areas related to their working group
7. In addition to memos on Docushare, maintain a (possibly separate) web page that describes the status of the WGs activities
8. Approve standard results from their group to be submitted to the collaboration board for publication and presentation.
9. Request a paper committee for journal publication of approved results

The people within a physics working group should generally be organized by the working group leader, with a mailing list established. However, all physics working group activity is open to the entire collaboration at any time. Regular meeting times and activities should be established whenever possible to encourage all who are interested to be able to plan on participation. The working groups are encouraged to schedule regular biweekly teleconferences and/or videoconferences.

Internal Review Process

Internal review is the process by which the IceCube collaboration will assure uniform and high standards for the publication and communication of physics results to the community. Analyses of IceCube data and preparation of physics results require three levels of approval:

1. Approval of analysis before application to data samples
2. Approval as preliminary result for communication at conferences and talks
3. Approval of final results for publication in refereed journals

a) Approval of analysis

The IceCube collaboration requires that precautions are taken that prevent the analyzer from biasing the analysis results toward their own preconceptions while their analysis is under development. Physics working groups are charged with ensuring that analyses are developed in an unbiased manner through the application of the appropriate techniques (e.g. blindness).

Analyses undergo review by at least two dedicated reviewers, one working group appointed, and one analysis coordinator appointed. While all collaboration members are encouraged to review and comment on analyses, the reviewers are charged to follow the analysis through the:

1. Review and approval in the working group.
2. Presentation, review and approval at the weekly analysis call.
3. Initial presentation of results at the weekly analysis call.

A period of at least two weeks is required between the first presentation of an analysis for review at the weekly analysis call before analysis approval can be granted to allow sufficient time for collaboration review. Review and approval of the working group is granted by the working group convener(s) and final analysis approval is granted by the analysis coordinator.

b) Approval of preliminary results for talks

For approval of preliminary results to be disseminated to the community at scientific talks and conferences the following must happen:

1. Approval by physics working group.
2. Presentation at two consecutive weekly analysis calls where approval is sought from the collaboration.
3. Approval by the Analysis Coordinator.

Normally, a memo or wiki page with supporting information should be disseminated to the collaboration no less than two weeks before the decision on the analysis call.

Upon approval, the result becomes an official preliminary result that is available for use in talks and conferences by any collaboration member. The result will be placed in a common collaboration area on the IceCube web pages by the physics working group.

c) Publication of papers

The publication of a result in a paper is initiated within a physics working group. The results to be published must be approved by the collaboration as described above. An outline for the paper will have been presented and discussed on the weekly analysis call for approval by the collaboration. Once a draft of the paper exists, the working group leader(s) will contact the chair of the publication committee to jointly appoint a referee panel consisting of one working group internal expert and one collaboration member from outside the working group. The panel will be led by a publication committee member. The task of the referee panel will be to review the draft and see to it that any remaining physics issues are resolved. Once the draft is deemed mature, the referee panel (extended at this stage to include an additional collaboration member) then oversees and approves the steps 3-6 listed below, leading to journal submission.

1. A paper outline is created and approved within the physics working group, outlining the paper contents, key figures and conclusions being drawn.

2. The paper outline is presented at the weekly analysis call, and 1 week is permitted for comments and discussion before the paper outline is approved.
3. The mature draft of the paper is sent to the collaboration. Two weeks are allowed for all comments on the paper. The paper, the comments, and answers to the comments are all to be posted on the paper's webpage.
4. When the collaboration review results in substantial requested changes to the paper, a new version of the paper that addresses these changes will be posted to the paper's webpage and circulated to the collaboration. This may result in an extension to the original two week review period.
5. When the referee panel is satisfied that questions and comments have been satisfactorily addressed, the final draft of the paper is presented to the collaboration for approval.
6. The publication committee considers the paper for submission. The decision to submit is made by the Spokesperson and the chair of the publication committee.

The publication of technical results in a paper, not originating from a physics working group, is initiated by the primary authors via an outline for the paper presented and discussed on the weekly analysis call for approval by the collaboration. Once a draft of the paper exists, the authors will contact the chair of the publication committee who will appoint a referee panel composed of two collaboration experts on the technical topic and one additional collaboration member. The panel will be led by a publication committee member. Where appropriate, the paper may be first reviewed within a channel working group and then follow the steps 3-6 listed above. In the case where a channel working group is not available to review the paper draft to approve its mature state, the paper will follow the six step procedure outlined above with the following substitutions for steps 3 and 4:

3. A first draft of the paper is sent to the collaboration. Two weeks are allowed for comments which should be mainly of a substantive nature, but can also be editorial. The paper, comments, and answers to comments should all be posted on the web.
4. When the referee panel is satisfied that questions and comments have been satisfactorily addressed, a second draft will be presented to the collaboration. These comments should be editorial in nature. The paper, comments, and answers to comments should all be posted on the web.

d) Unusual physics topics or topics of a general nature

In the event of an analysis that does not fall within a physics working group, the analysis coordinator will contact the chair of the publication committee to jointly appoint a referee panel.

A topic of a general nature or a physics topic which should be dealt with in publication but is not being addressed can be brought before the Collaboration Board by the Spokesperson, the chair of the publication committee and/or the analysis coordinator. The Collaboration Board appoints an individual (or individuals) responsible for producing a paper outline followed by a draft paper and if necessary for performing the analysis.

e) Circumstances requiring express analysis

If a case arises that would require an express analysis of IceCube data in order to increase the impact in a timely way (e.g. A strong flaring object such as occurred for the “naked-eye” GRB) the Analysis Coordinator and/or Spokesperson have the authority to circumvent the normal time periods for review. The Analysis coordinator and Spokesperson can at their discretion ask for concurrence from the executive committee and/or ICB.

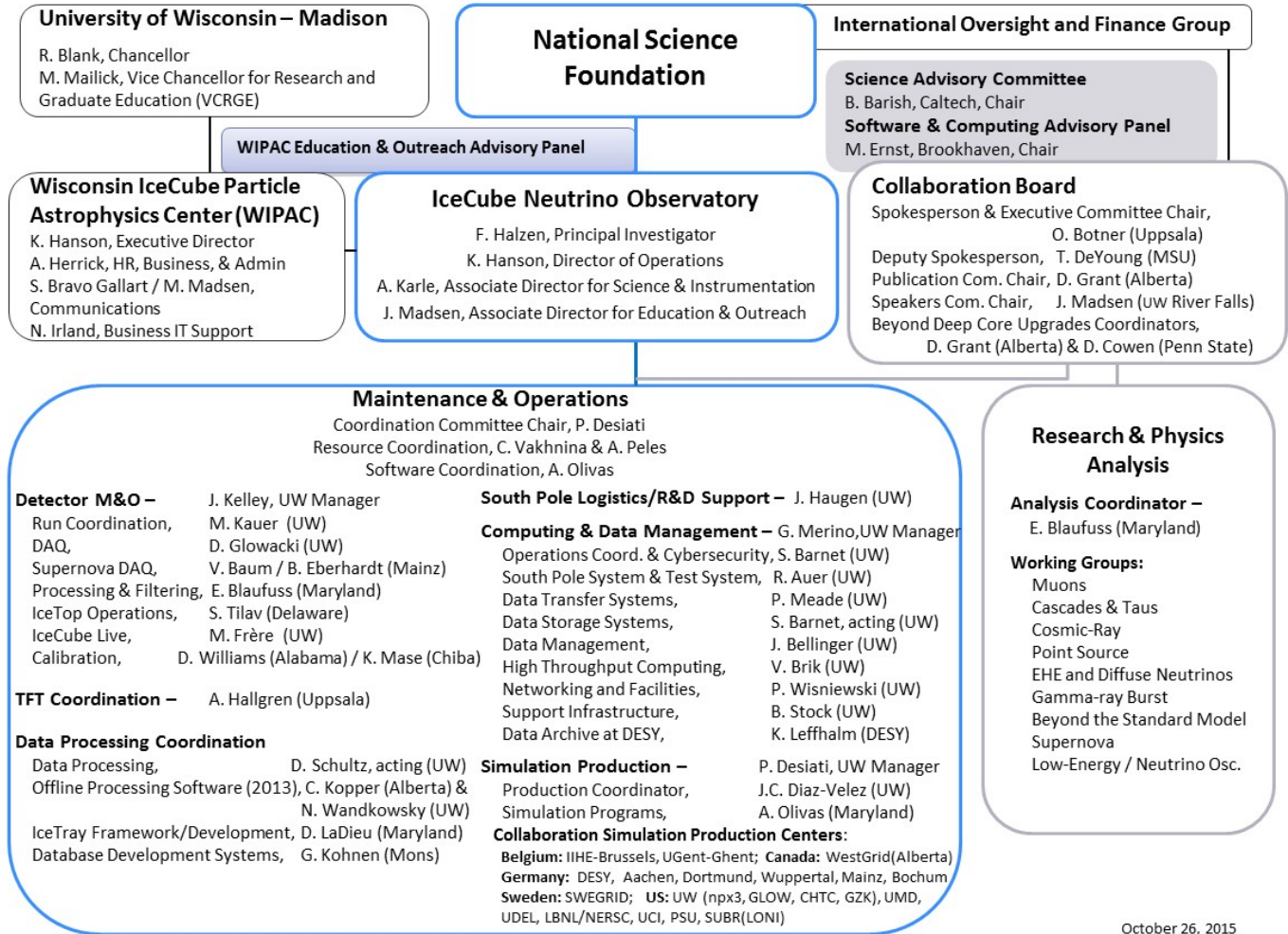
Non-IceCube publications by IceCube members

Collaboration members co-authoring non-IceCube publications which at any level relate to IceCube (for instance relying on internal discussions within IceCube, using IceCube infrastructure (hardware or software), or relying heavily on published IceCube results) should notify the IceCube Publication Committee prior to the submission of any manuscript to archive or journal. The Publication Committee may decide to forward such information to the full collaboration.

Talks

The policy on talks and presentations and on the speakers committee is set forth in section 9.

IceCube M&O Organization



October 26, 2015

Appendix D: International Oversight and Finance Group - IOFG

The International Oversight and Finance Group (IOFG) is a committee created in 2004 to provide oversight and financial support for the IceCube Neutrino Observatory (including Construction phase, Maintenance & Operations and Research phases). The Group organizes annual oversight reviews of the operations and meets annually to discuss detector performance and physics. The Group also sets policies for receiving periodic progress reports on all aspects of the detector operation and by all the performers in the collaboration, and for conducting external reviews when appropriate.

Membership

A representative of the National Science Foundation chairs the IOFG. Membership is comprised of representatives of the funding agencies in the partner countries supporting the construction and operation of IceCube Neutrino Observatory, currently comprised of funding agencies from Belgium, Germany, Sweden, and the United States. The Group is informed by the Spokesperson of the Collaboration, the Director of Operations, the Principal Investigator and others as appropriate.

Decisions

The Group is committed to operate through discussion and consensus. The Executive Agent (the NSF) will make final decisions on matters before the group related to the operation of IceCube.

Issues that may come before the Group include:

- Approval of a formal charter for the Group.
- Review of Memoranda of Understanding (MOU) between the various institutions.
- Concurrence on the Maintenance and Operations Plan.
- Funding issues.
- Concurrence on the Collaboration's plans for new membership in the collaboration.
- Data sharing and data management policies.
- Coordination regarding press releases and education and outreach activities.
- Input on seasonal flight and personnel logistics planning.
- Other matters related to successful operation of the IceCube Neutrino Observatory for science.

Appendix E: Dissemination and Sharing of IceCube Research Results and Data

This defines the IceCube strategy for providing access to research results and data by the broader research community. NSF policies and guidance promote efforts by grantees to produce the timely publication of results and to make data and software available to other researchers. In addition, the Parties to the Antarctic Treaty agree that, to the greatest extent feasible and practicable, scientific observations and results from Antarctica shall be exchanged and made freely available.

IceCube is a facility-class experiment with the primary goal to identify sources of astrophysical neutrinos. NSF supports a wide range of approaches to the release of facility data, e.g., the particle physics model where data is exclusively available to members of the collaboration and the astronomy model where data are readily made public.

The Large Hadron Collider experiments follow the particle physics model; the Atacama Large Millimeter/submillimeter Array (ALMA) – the astronomy model; and, the Wilkinson Microwave Anisotropy Probe (WMAP) – an intermediate model. IceCube is similar to WMAP and large air shower experiments where data is collected, analyzed, published and released.

The public release of data in a scientifically meaningful way is not a trivial undertaking. Currently there are three ways to access IceCube data:

1. IceCube Collaboration Membership
2. Associate Membership
3. Direct Access to IceCube Public Data Pages

IceCube Collaboration Membership – The IceCube Collaboration consists of scientists at Collaboration Constituent Institutions. The condition for membership and for institutional recognition is that the group makes a significant contribution to IceCube.

Any scientist or group of scientists may apply to the Spokesperson of the Collaboration for membership of their institution in IceCube. Details on these arrangements can be found elsewhere in this IceCube Collaboration Governance Document. New groups join the IceCube Collaboration every year providing evidence that membership is a proven way to access IceCube data.

Associate Membership – Scientists outside the IceCube Collaboration who have a concept for a particular analysis can apply to the Collaboration for Associate Membership for the purpose of performing a particular analysis or class of analyses within the Collaboration. Papers that cover the research in question are co-signed by the associate and the collaboration. The Associate Member has no other rights or responsibilities within IceCube. Associate Membership may be preferred over joining the Collaboration, a rather lengthy process that requires financial and service contributions operations.

There are a number of active Associate Members including the University of Tokyo and the South Dakota School of Mines and Technology.

Direct Access to IceCube Public Data Pages – Raw data is securely stored and backed up, consistent with NSF policy. Extracting science from the data requires the use of elaborate hardware and software tools developed by the Collaboration. Like any other particle physics detector, data directly relevant to a scientific issue are obtained after analysis chains that

typically require the coordinated efforts of several members of the Collaboration.

In order to be responsive to both the scientific communities' need for usable scientific data and to the NSF requirement for public access to unselected data, IceCube plans to release data in two ways.

1. Release of event reconstruction information for events selected as neutrinos from the overwhelming background of cosmic ray muons.
2. Release of primary event data on all events transferred north over the satellite and used as the basis for analyses.

Data will be made available upon publication of results. For example, when the initial searches for point sources, neutrinos from transient sources, and diffuse astrophysical neutrinos are published the relevant event information associated with this analysis will be made available in an easy to read format. The event information will include reconstructed direction (right ascension, declination), time, reconstructed energy, and quality information of these events. Partial information may be made available earlier.

The IceCube Collaboration has created a data release webpage that serves as the entry point for future data releases to the scientific community, <http://www.icecube.wisc.edu/science/data>. Initially, this webpage contains release of the 2000-2006 AMANDA data. The URL to IceCube data release webpage is an explicit reference in the corresponding journal publication and will remain the same during IceCube operations (Abbasi *et al* (IceCube Collaboration) Phys.Rev.D79:062001, 2009. e-Print: arXiv:0809.1646). A second, similar, entry point will be developed and made available to the public for the release of "primary" data.

IceCube data releases will follow a similar procedure as the process used to release the AMANDA data. The first paper completed on the combined seven-year data set was the point source analysis. The initial release included right ascension and declination. A second update included identifiers for events included in a publication on atmospheric neutrinos and the Lorentz invariance. This sample is a subset of the full point source data set and meets the highest purity requirements. The final update to the data release page for AMANDA included the event times at full precision after a time dependent analysis on this event sample was completed.

During the operations phase of IceCube it is anticipated that IceCube neutrino data will be released within two to three years after the completed run in which the data are acquired. It is anticipated that the event information will consist of the reconstructed event information and quality information, including the likelihood that an event is caused by a neutrino. The event information might also include a measurement on the probability of the event being a muon or a cascade.

Important requirements for data release are: 1) the IceCube Collaboration's analyses are completed in accordance with the Collaboration's internal approval processes, which include adhering to the principles of blind analyses where practical, and, 2) the calibrations and reconstructed event information is high quality and it is unlikely the information will need to be changed or corrected.

Once IceCube is in steady state operation we continue to plan on annual cycles of data runs beginning in April. Data runs will consist of defined conditions of triggers, thresholds and

operational conditions of the detector. The working groups analyze these data sets for the various physics analyses. A reasonable assumption is that ten to fifteen publications will be made using the annual data set and completed on a time scale of two years. Approximately two years after the annual data run is complete it is reasonable to expect that event information can be released. The data release cycle will follow the run completion cycle with a fixed time delay.

The sequence from data taking to publication can be summarized as follows:

1. Data Taking Run (~12 months)
2. Data Processing by Adding IceCube Event Reconstructions
3. Data Analyses for Specific Science Goals
4. Preparation of the Final Data Set
5. Perform Final Physics Analyses and Un-Blind Results
6. Publish Results
7. Release Data Set 1
8. Release Data Set 2

Data Release Set 1 – reconstructed events for the scientific community

The released data that is already reconstructed and most background events will have been removed from the final dataset published, will consist of the following quantities:

Event Time (MJD)

Direction (RA, Dec)

Directional Error

Degrees of Freedom in Fit

Energy Estimator

Flags to Indicate Event Type (e.g., track like, cascade like, etc.)

We plan to release these data in versions of event catalogs. We may revise a catalog of an earlier year to update information to include better reconstruction algorithms and filtering processes to offer a combinable set of data to the scientific community. Based on feedback from this community we may add more information in later releases to accommodate all types of community requests.

Data Release Set 2 – Public access of primary data

The release that contains all the primary detector data, which is calibrated, but not reconstructed, will consist of the following quantities:

Run/Event header with trigger information, event data and time, etc...

Array of all DOM signals with calibrated position, time, and charge (x,y,z,t,q)

We plan to release these events as yearly sets with the entire primary data in binary files on a time scale consistent with the release of data set 1. We will also supply on the website additional documentation to the public including a description of the binary data format, a general description of the detector quantities and what they represent, some illustrative event display pictures, links to relevant publications documenting the detector, and may possibly supply an event reader for a single platform and language. The anticipated size of one full year primary data is several to ten Terabytes, and may optionally require a small charge to cover the cost of physical media or internet server usage.