GNN Monthly
The Global Neutrino Network 100th Edition November 19,2025
https://www.globalneutrinonetwork.org/

Oops!? 100...

This turns out to be the 100th edition of GNN Monthly!

The first appeared on July 14, 2016, still with a self-designed headline and with only two pages length:

GNN Monthly
The Global Neutrino Network

Here my introductory words:

July 14, 2016

*This is the first edition of "**GNN Monthly**". It is an attempt to improve the mutual communication and awareness between the four member collaborations of the Global Neutrino Network, GNN: ANTARES, Baikal-GVD, IceCube and KM3NeT. For those who want to know more about intentions and rules of GNN, please go to http://www.globalneutrinonetwork.org/.*

*Note that **GNN Monthly** may also include information which is not intended to be spread outside GNN.*

Whether we will have enough material to release this letter really "monthly" remains to be seen. It certainly needs the input from all of you!

Christian Spiering (Chair of the GNN Board)

The new design was introduced only in the sixth edition, in January 2017, that edition already with some very short reviews of collaboration papers:

GNN Monthly
The Global Neutrino Network 7th Edition January 29, 2017

It was only in 2022 that on the request of Albrecht Karle an imprint was added:

Impressum
GNN Monthly is the Monthly Newsletter of the Global Neutrino Network
https://www.globalneutrinonetwork.org
Editor: Christian Spiering, for the GNN Board
christian.spiering@desy.de

Leafing through a decade of *GNN Monthly* is an interesting journey. The first edition reports about the first full-scale cluster deployed by the Baikal collaboration in Spring 2016. The KM3NeT collaboration had just published its "KM3NeT 2.0 Letter of Intent" in Journal of Physics. ARCA was laboring with the first three Detection Units and electrical power issues. With respect to IceCube the newsletter reports: "With a view to the future: a new design for PINGU has been worked out which delivers the same performance with fewer strings and so can be deployed in fewer seasons." Both ANTARES and IceCube had published joint analyses with the ultrahigh-energy cosmic ray community and LIGO. The first evidence for a point source, TXS 0506-056, was still to come (2017).

The length of the letter was steadily growing, the longest was 10 pages, as far as I remember (this will hopefully never happen again!) My 2016 question whether we will have enough material to release this letter really "monthly" is answered meanwhile: there was enough material, and GNN Monthly actually appeared about twelve times per year.

For one and a half year, a web version *of GNN Monthly* was created in Dubna and was posted on the JINR webpage (omitting a few really internal news). This came to an end in February 2022, after the Russian invasion into Ukraine.

GNN Monthly would not have been possible without the input I received from the spokespersons of the collaborations and from many others. I am particularly indebted to Uli Katz, who – newsletter after newsletter – was and is my proofreader, never with less than ten remarks and corrections. Thank you Uli!

New from the projects

IceCube

This season of the Antarctic Summer is the season of the IceCube Upgrade. In the first week of November, the South Pole station population tripled, and many of the new arrivals were IceCubers (On Tuesday, Nov. 4, 21 of them made it to the South Pole). The two new winterovers for the upcoming season, Camille and Alicia, were welcomed out on the ice by the outgoing winterovers, Joe and Ilya, with a cardboard sign – see the photo taken by Jennifer Wang, IceCube. IceCube's incoming and outgoing winterovers generally have some overlap time together at the Pole in order to train and hand over duties.

The top priority of the early bird crew was to get the ARA (Rodwell) drill and generator up and running (a Rodwell - or Rodriguez well - uses hot water to melt snow or ice to create a subsurface water reservoir). The ARA drill will be used early in the season to develop a Rodwell for supplying makeup water to the main drill. Meanwhile, traverse "train" took off from McMurdo, bringing the Main Cables and also some sorely needed heavy equipment and snow mobiles, along with its main fuel cargo. If all goes well, the traverse will arrive around Thanksgiving (Nov.27).

Three tractors of the traverse train before leaving McMurdo

Meanwhile (Nov. 17) eight more IceCubers arrived at the South Pole. Ten of the meanwhile 29 IceCube people belong to the drill team.

Much of the initial work is fighting against the winter snow drift which, for instance, had buried stored hoses under several feet of snow. They had to be painstakingly dug out by hand so as not to damage them. The photo below shows an IceCuber shoveling out containers of the Drill Tower operation site.

Shoveling out the Tower Operation Site buildings near ICL

KM3NeT

New laboratory inauguration for KM3NeT: At November 10, a new KM3NeT laboratory, INTEGRA, was inaugurated in Salerno, about 50 kilometers South of Napoli at the Tyrrhenian coast. The INTEGRA (INTEGration & Research Area) laboratory is dedicated to assembling and testing KM3NeT DOMs.

The creation of the INTEGRA laboratory is made possible through the joint efforts of the University of Salerno and INFN, within the framework of the Italian "KM3NeT4RR project". KM3NeT4RR aims at expanding the ARCA detector and at speeding up its construction.

A photo from the INTEGRA opening ceremony.

KM3NeT joins IPPOG: At Nov. 11, the KM3NeT Collaboration became member of the IPPOG Collaboration. IPPOG, the International Particle Physics Outreach Group, is a world-wide collaboration aimed at fostering science education and public engagement for particle physics. Membership to IPPOG is possible for research agencies, international and national laboratories and scientific collaborations.

The KM3NeT AISBL (*Association Internationale Sans But Lucratif*) has been founded in June of this year (https://www.km3net.org/km3net-aisbl-is-born/) and is now officially established by a Belgian "Royal Decree" which has just been published, so the AISBL now also exists formally and will become operating in January 2026.

KM3NeT++: The Netherlands Organization for Scientific Research (NWO) is funding two major Nikhef projects in the Roadmap program for large-scale research infrastructure. A total of €33.5 million will be allocated to the FASTTRACK and KM3NeT++ projects.

The KM3NeT++ proposal concerns the funding of additional 20 lines of the ORCA detector. With this new funding, ORCA can be almost completed. In addition, the test of a prototype of an acoustic detector developed in the Netherlands is funded.

P-ONE

P-ONE members have just met in Montreal at the Thomson House with the newly formed Resource Board to baseline the P-ONE Demonstrator phase. A full project-control framework is now in place including the consolidated international budget and a first critical-path analysis and all the funds required for this next step have been secured.

A snapshot from the meeting

RNO-G

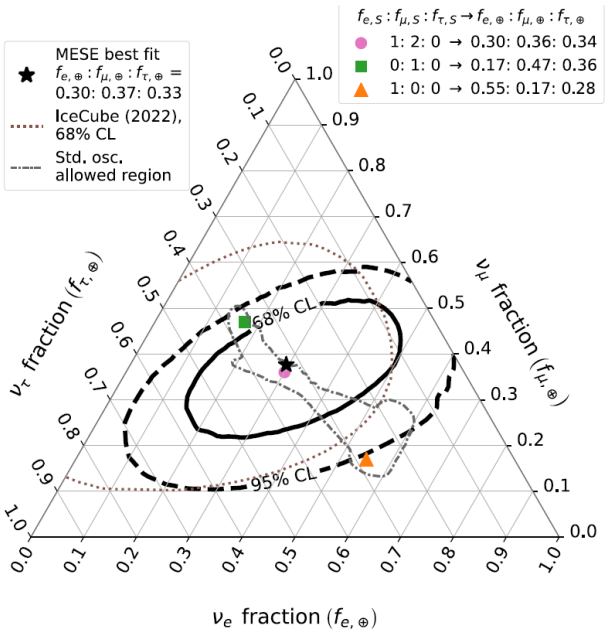
Anna Nelles reports: The northern winter is typically quiet for RNO-G, since the stations enter winter-mode when the sun light no longer provides sufficient

power. In this mode they only transmit very basic data, such as their temperature and their battery voltage via *LORAwan*. The collaboration meanwhile focuses on the preparation of the next installation season. Positive news: a few stations with the newest wind-turbines have woken up with fully charged batteries. They will now telemeter more detailed performance data to improve our understanding of the turbines in the hope of being able to operate RNO-G also in winter in the future.

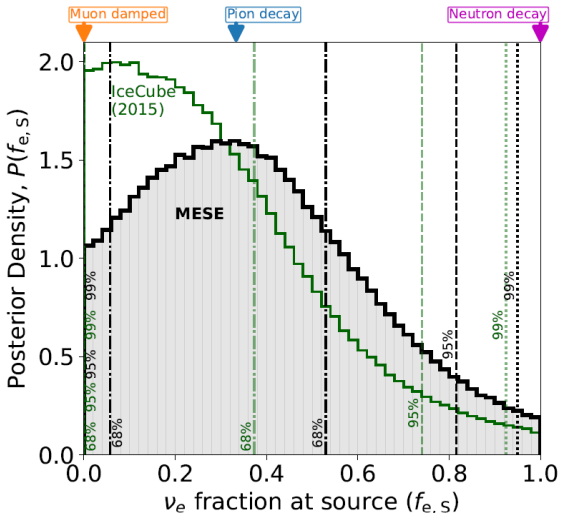
Publications

The IceCube Collaboration has released a paper *Characterization of the Three-Flavor Composition of Cosmic Neutrinos with IceCube* (submitted to Phys. Rev. Lett., posted at https://arxiv.org/pdf/2510.24957). Main authors of the paper are Aswathi Balagopal (UW Madison and Bartol Res. Inst., Delaware) and Vedant Basu (Univ. of Utah).

Using 11.4 years of IceCube data, the flavor composition of the all-sky neutrino flux from 5 TeV–10 PeV is studied. The paper reports the first measurement down to the O(TeV) scale using events classified into three flavor-dependent morphologies. The best fit flavor ratio is $f_e : f_\mu : f_\tau = 0.30 : 0.37 : 0.33$, consistent with the standard three-flavor neutrino oscillation model. Each fraction is constrained to be > 0 at > 90% confidence level, assuming a broken power law for cosmic neutrinos. Inferring the flavor composition of cosmic neutrinos at their sources, one finds that production via neutron decay lies outside the 99% confidence interval (see the second figure next column).



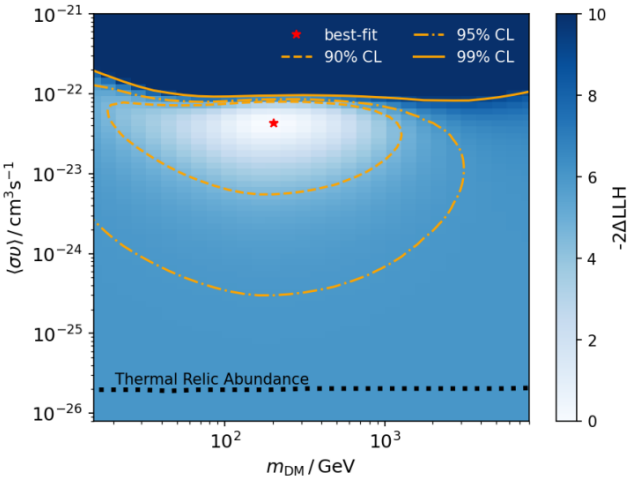
Ternary diagram of the results of the flavor composition fit: The axes show the fraction of ν_e, ν_μ and ν_τ at Earth. 68% and 95% CL contours assuming the test statistic follows Wilks' theorem are shown as solid and dashed lines, respectively. Expected flavor composition at Earth, after standard oscillations, for benchmark production mechanisms (pion decay: circle, muon damping: square, neutron decay: triangle) and all possible flavor compositions after propagation (dash-dot line) are shown. The dotted line shows the 68% CL contour from IceCube's last measurement.



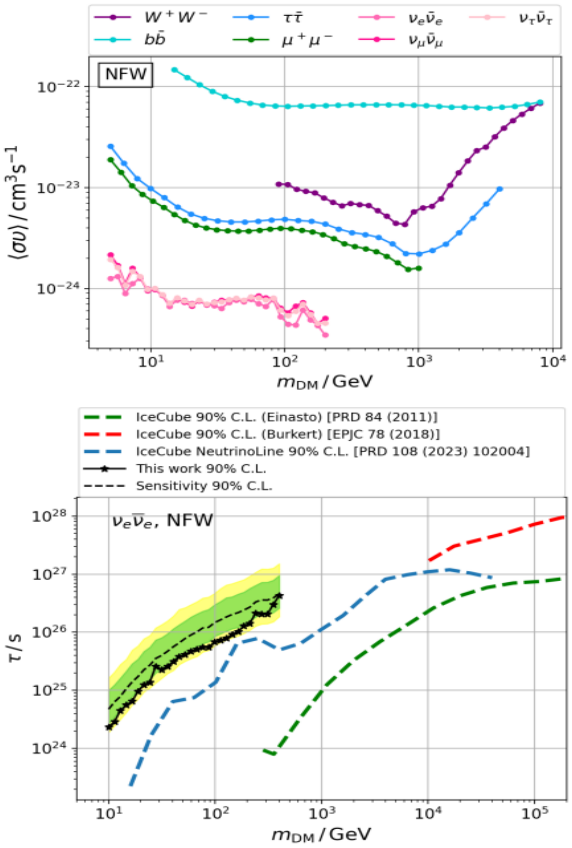
Posterior distribution of flavor composition at source: Assuming $f_{\tau,S} = 0$ and global best-fit mixing parameters (normal ordering) with their χ^2 distributions from [Esteban et al., NuFit-6.0: updated global analysis of three-flavor neutrino oscillations, J. High Energy Phys. 12, 21650], and the likelihood profile obtained with the L_{max} fit to the MESE dataset. The same with the likelihood profile from the IceCube (2015) analysis, which reported more constraining rejection of neutron decay with the L_{max} fit.

The IceCube Collaboration has released a paper *Search for GeV-scale Dark Matter from the Galactic Center with IceCube-DeepCore* (posted at https://arxiv.org/pdf/2511.00918, submitted to Phys. Rev. Lett.). Main author of the paper is N. Chau (Université Libre de Bruxelles).

This work searches for neutrinos from dark matter annihilation in the galactic center using ~9 years of IceCube-DeepCore data with an event selection optimized for energies between 15 GeV to 200 GeV. The paper considers several annihilation and decay channels and dark matter masses ranging from 15 GeV up to 8 TeV. No significant deviation from the background expectation from atmospheric neutrinos and muons was found. The highest post-trial significance of 1.08 σ was found for a dark matter mass of 201.6 GeV annihilating into a pair of b-anti-b quarks assuming the Navarro-Frenk-White halo profile. The papers present an upper limits on the thermally-averaged annihilation cross-section of the order of 10^{-24} cm^3 s^{-1} , as well as lower limits on the dark matter decay lifetime up to 10^{26}s for dark matter masses between 5 GeV up to 8 TeV. These results strengthen the current IceCube limits on dark matter masses above 20 GeV and provide an order of magnitude improvement at lower masses. In addition, they represent the strongest constraints from any neutrino telescope on GeV-scale dark matter and are among the world-leading limits for several dark matter scenarios.



−2ΔLLH scan for the best-fit DM scenario: annihilation of DM into b-anti-b with NFW profile. Contours are derived assuming Wilk's theorem.

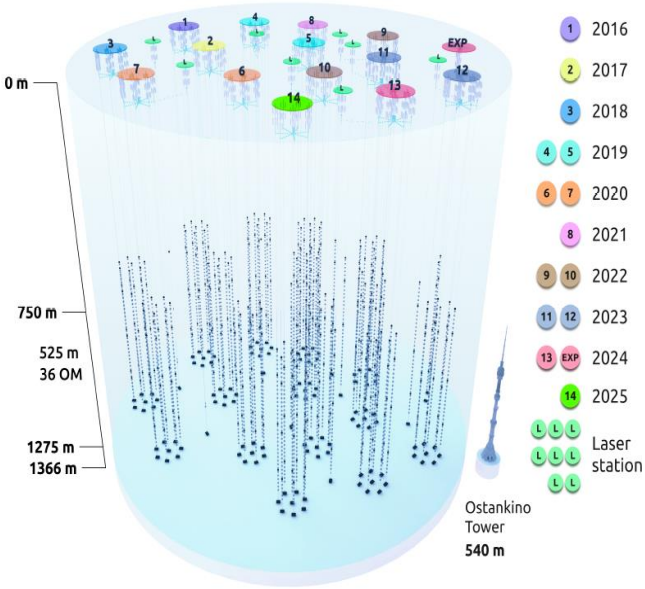


90% C.L. upper limits on the thermally-averaged self-annihilation cross-section ⟨συ⟩ (top) and lower limit on lifetime τ (bottom) of DM as a function of its mass for both the Navarro-Frenk-White (NFW) halo profile (see the paper for the "Burkert profile"). The dots represent the mass values at which the limits are evaluated.

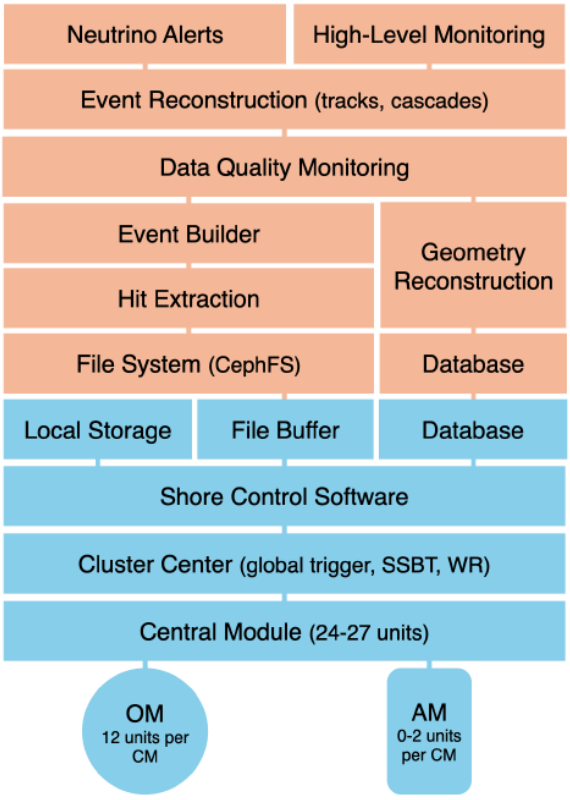
The Baikal-GVD Collaboration has released a paper *Design and Implementation of the Fast Data Processing System for the Baikal-GVD Neutrino Telescope* (posted at https://arxiv.org/pdf/2511.03438, submitted to JINST). The corresponding author is Bair Shaybonov (JINR Dubna).

Leveraging Baikal-GVD's modular cluster architecture, the GVD data processing system implements parallelized file processing where raw data files undergo concurrent analysis across dedicated virtual machines. The system implements two pipelines: a fast per-file processing and a fully-fledged (per-run) processing, which integrates dynamic detector geometry determined from acoustic and inertial positioning systems and data quality monitoring with a latency of ≈27 hr. The fast-processing pipeline delivers a total latency of about 1.5–18 minutes from event detection to reconstructed data availability,

depending on water luminescence levels. This enables fast follow-up observations of transient astrophysical sources, fulfilling Baikal-GVD's role in multi-messenger networks. The article also highlights key features of the data acquisition system, the integration of advanced synchronization systems and a robust infrastructure for data handling and storage, ensuring efficient and reliable operation of the detector.



Baikal-GVD in 2025. The legend shows the detector construction progress by year.



Baikal-GVD data processing scheme for one cluster: offshore and onshore components are blue, remote components of the data processing system are red. See details on each component in the paper. For brevity, the string modules that act as network hubs for three sections in a string are omitted.

Miscellaneous

I just got the message from Antonino Capone, that 10th RICAP is planned for September 7th to 11th, 2026, hosted by the Physics Department of Sapienza University and the INFN Session of Roma. The last one was held in September 2024 in Frascati, with more than 220 participants.

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