

Mauricio Bustamante  
Assistant Professor  
Niels Bohr International Academy  
Theoretical high energy, astroparticle and gravitational physics

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## Qualifications

Physics, PhD

2012 → 2014

Physics, M. Sc.

2007 → 2010

Physics, B. Sc.

2001 → 2006

## Employment

### Niels Bohr International Academy

København Ø

1 Oct 2020 → 30 Sep 2024

### Assistant Professor

Theoretical high energy, astroparticle and gravitational physics

København Ø, Denmark

1 Oct 2017 → nu

## Research output

### The Milky Way shines in high-energy neutrinos

Bustamante, Mauricio, 13 Dec 2023, In: Nature Reviews Physics. 6, p. 8-10 3 p.

### Searches for dark matter decay with ultrahigh-energy neutrinos endure backgrounds

Fiorillo, Damiano Francesco G, Valera, Victor, Bustamante, Mauricio & Winter, W., 8 Nov 2023, In: Physical Review D. 108, 10, 26 p., 103012.

### Neutrino self-interactions: A white paper

Berryman, J. M., Blinov, N., Brdar, V., Brinckmann, T., Bustamante, M., Cyr-Racine, F. Y., Das, A., de Gouvêa, A., Denton, P. B., Dev, P. S. B., Dutta, B., Esteban, I., Fiorillo, D., Gerbino, M., Ghosh, S., Ghosh, T., Grohs, E., Han, T., Hannestad, S., Hostert, M. & 14 others, Huber, P., Hyde, J., Kelly, K. J., Kling, F., Liu, Z., Lattanzi, M., Loverde, M., Pandey, S., Saviano, N., Sen, M., Shoemaker, I. M., Tangarife, W., Zhang, Y. & Zhang, Y., 29 Sep 2023, In: Physics of the Dark Universe. 42, 25 p., 101267.

### Present and future constraints on flavor-dependent long-range interactions of high-energy astrophysical neutrinos

Agarwalla, S. K., Bustamante, Mauricio, Das, S. & Narang, A., 18 Aug 2023, In: Journal of High Energy Physics. 2023, 8, 48 p., 113.

**Flavor-dependent long-range neutrino interactions in DUNE & T2HK: alone they constrain, together they discover**  
Singh, M., Bustamante, Mauricio & Agarwalla, S. K., 17 Aug 2023, In: Journal of High Energy Physics. 2023, 8, 36 p., 101.

**Bump hunting in the diffuse flux of high-energy cosmic neutrinos**  
Fiorillo, Damiano Francesco G & Bustamante, Mauricio, 4 Apr 2023, In: Physical Review D. 107, 30 p., 083008.

**Near-future discovery of point sources of ultra-high-energy neutrinos**  
Fiorillo, Damiano Francesco G, Bustamante, Mauricio & Valera, Victor, 1 Mar 2023, In: Journal of Cosmology and Astroparticle Physics. 2023, 3, 41 p., 026.

**Near-future discovery of the diffuse flux of ultrahigh-energy cosmic neutrinos**  
Valera, Victor, Bustamante, Mauricio & Glaser, C., 16 Feb 2023, In: Physical Review D. 107, 4, 43 p., 043019.

**Snowmass white paper: beyond the standard model effects on neutrino flavor**  
Arguelles, C. A., Barenboim, G., Bustamante, M., Coloma, P., Denton, P. B., Esteban, G. F., Farzan, Y., Martinez, E. F., Forero, D., Gago, A. M., Katori, T., Lehnert, R., Ross-Lonergan, M., Suliga, A. M., Tabrizi, Z., Anchordoqui, L., Chakraborty, K., Conrad, J., Das, A., Fong, C. S. & 6 others, Littlejohn, B. R., Maltoni, M., Parno, D., Spitz, J., Tang, J. & Wissel, S., 11 Jan 2023, In: European Physical Journal C. 83, 1, 57 p., 15.

**High-energy and ultra-high-energy neutrinos: A Snowmass white paper**  
Ackermann, M., Agarwalla, S. K., Alvarez-Muniz, J., Batista, R. A., Arguelles, C. A., Bustamante, M., Clark, B. A., Cummings, A., Das, S., Decoene, V., Denton, P. B., Dornic, D., Dzhalikbaev, Z.-A., Farzan, Y., Garcia, A., Garzelli, M. V., Glaser, C., Heijboer, A., Horandel, J. R., Illuminati, G. & 26 others, Jeong, Y. S., Kelley, J. L., Kelly, K. J., Kheirandish, A., Klein, S. R., Krizmanic, J. F., Larson, M. J., Lu, L., Murase, K., Narang, A., Otte, N., Prechelt, R. L., Prohira, S., Reno, M. H., Resconi, E., Santander, M., Valera, Victor, Vandenbroucke, J., Suvorova, O. V., Wiencke, L., Wissel, S., Yoshida, S., Yuan, T., Zas, E., Zhelning, P. & Zhou, B., Nov 2022, In: Journal of High Energy Astrophysics. 36, p. 55-110 56 p.

**Search for quantum gravity using astrophysical neutrino flavour with IceCube**  
Abbasi, R., Ackermann, M., Adams, J., Aguilar, J. A., Ahlers, Markus Tobias, Ahrens, M., Alameddine, J. M., Alispach, C., Alves, A., Amin, N. M., Bourbeau, E., Koskinen, D. Jason, Kozynets, T., Bustamante, Mauricio, Mead, J., Stuttard, Thomas Simon, Rameez, M. & Icecube Collaboration, I. C., 24 Oct 2022, In: Nature Physics. 18, p. 1287-1292 16 p.

**Tau neutrinos in the next decade: from GeV to EeV**  
Abraham, R. M., Alvarez-Muniz, J., Arguelles, C. A., Ariga, A., Ariga, T., Aurisano, A., Autiero, D., Bishai, M., Bostan, N., Bustamante, M., Cummings, A., Decoene, V., de Gouvea, A., De Lellis, G., De Roeck, A., Denton, P. B., Di Crescenzo, A., Diwan, M., Farzan, Y., Fedynitch, A. & 46 others, Feng, J. L., Fields, L. J., Garcia, A., Garzelli, M. V., Gehrlein, J., Glaser, C., Grzelak, K., Hallmann, S., Hewes, J., Indumathi, D., Ismail, A., Jana, S., Jeong, Y. S., Kelly, K. J., Klein, S. R., Kling, F., Kosc, T., Kose, U., Koskinen, D. Jason, Krizmanic, J., Lazar, J., Li, Y., Martinez-Soler, I., Mocioiu, I., Nam, J., Niess, V., Otte, N., Patel, S., Petti, R., Prechelt, R. L., Prohira, S., Rajaoalisoa, M., Reno, M. H., Safa, I., Sarasty-Segura, C., Senthil, R. T., Stachurska, J., Tomalak, O., Trojanowski, S., Wendell, R. A., Williams, D., Wissel, S., Yaeggy, B., Zas, E., Zhelning, P. & Zhu, J., 11 Oct 2022, In: Journal of Physics G: Nuclear and Particle Physics. 49, 11, 148 p., 110501.

**The ultra-high-energy neutrino-nucleon cross section: measurement forecasts for an era of cosmic EeV-neutrino discovery**  
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**PLEvM: A global and distributed monitoring system of high-energy astrophysical neutrinos**  
Schumacher, L., Huber, M., Agostini, M., Bustamante, Mauricio, Oikonomou, F. & Resconi, E., 27 Jul 2021, In: P o S - Proceedings of Science. 395, 8 p., 1185.

**Flavors of astrophysical neutrinos with active-sterile mixing**  
Ahlers, Markus Tobias, Bustamante, Mauricio & Willesen, N. G. N., 15 Jul 2021, In: Journal of Cosmology and Astroparticle Physics. 2021, 7, 20 p., 029.

### **The Future of High-Energy Astrophysical Neutrino Flavor Measurements**

Song, N., Weishi Li, S., Argüelles, C., Bustamante, Mauricio & Vincent, A. C., 12 Jul 2021, In: P o S - Proceedings of Science. 395, 8 p., ICRC 1178.

### **The POEMMA (Probe of Extreme Multi-Messenger Astrophysics) observatory**

Olinto, A., Krizmanic, J., Adams, J. H., Aloisio, R., Anchordoqui, L. A., Anzalone, A., Bagheri, M., Barghini, D., Battisti, M., Bergman, D. R., Bertaina, M. E., Bertone, P. F., Bisconti, F., Bustamante, M., Cafagna, F., Caruso, R., Casolino, M., Cerny, K., Christl, M. J., Cummings, A. L. & 31 others, De Mitri, Diesing, R., Engel, R., Eser, J., Fang, K., Fenu, F., Filippatos, G., Gazda, E., Guepin, C., Haungs, A., Hays, E. A., Judd, E. G., Klimov, P., Kungel, Kuznetsov, E., Mackovjak, S., Mandat, D., Marcelli, L., McEnery, J., Medina-Tanco, G., Merenda, K., Meyer, S. S., Mitchell, J. W., Miyamoto, H., Nachtman, J. M., Neronov, A., Oikonomou, F., Otte, A. N., Ricci, M., Unger, M. & POEMMA Collaboration, P. C., Jun 2021, In: Journal of Cosmology and Astroparticle Physics. 2021, 6, 66 p., 007.

### **The Future of High-Energy Astrophysical Neutrino Flavor Measurements**

Song, N., Weishi Li, S., Argüelles, C., Bustamante, Mauricio & Vincent, A. C., 20 Apr 2021, In: Journal of Cosmology and Astroparticle Physics. 2021, 04, 44 p., 054.

### **Core-collapse supernovae stymie secret neutrino interactions**

Shalgar, Shashank, Tamborra, Irene & Bustamante, Mauricio, 2021, In: Physical Review D. 103, 9 p., 123008.

### **Using High-Energy Neutrinos As Cosmic Magnetometers**

Bustamante, Mauricio & Tamborra, Irene, 4 Dec 2020, In: Physical Review D. 102, 12, 15 p., 123008.

### **The Giant Radio Array for Neutrino Detection (GRAND): Science and design**

Alvarez-Muniz, J., Batista, R. A., Balagopal, A., Bolmont, J., Bustamante, M., Carvalho, W., Charrier, D., Cognard, I., Decoene, V., Denton, P. B., De Jong, S., De Vries, K. D., Engel, R., Fang, K., Finley, C., Gabici, S., Gou, Q., Gu, J., Guepin, C., Hu, H. & 31 others, Huang, Y., Kotera, K., Le Coz, S., Lenain, J., Lu, G., Martineau-Huynh, O., Mostafa, M., Mottez, F., Murase, K., Niess, V., Oikonomou, F., Pierog, T., Qian, X., Qin, B., Ran, D., Renault-Tinacci, N., Roth, M., Schroeder, F. G., Schussler, F., Tasse, C., Timmermans, C., Tueros, M., Wu, X., Zarka, P., Zech, A., Zhang, B. T., Zhang, J., Zhang, Y., Zheng, Q., Zilles, A. & GRAND Collaboration, G. C., 4 Aug 2020, In: Science China Physics, Mechanics and Astronomy. 63, 1, 43 p., 219501.

### **Fundamental Physics with High-Energy Astrophysical Neutrinos Today and in the Future**

Argüelles, C., Bustamante, Mauricio, Kheirandish, A., Palomares-Ruiz, S., Salas-Salvadó, J. & Vincent, A. C., 22 Jul 2020, In: P o S - Proceedings of Science. 358, 8 p., 849.

### **Pushing the Energy and Cosmic Frontiers with High-Energy Astrophysical Neutrinos<sup>1</sup>**

Bustamante, Mauricio, 12 May 2020, In: Journal of Physics: Conference Series (Online). 1586, 9 p., 012041.

### **Bounds on secret neutrino interactions from high-energy astrophysical neutrinos**

Bustamante, Mauricio, Rosenstrøm, C. A., Shalgar, Shashank & Tamborra, Irene, 2020, In: Physical Review D. 101, 12, 12 p., 123024.

### **Observing GeV Neutrino Transients in the Multi-Messenger Era**

Ahmed Maouloud, S. E. M., de Wasseige, G., Ahlers, Markus Tobias, Bustamante, Mauricio & van Elewyck, V., 22 Jul 2019, In: P o S - Proceedings of Science. 358, 8 p., 1023.

### **Fundamental physics with high-energy cosmic neutrinos today and in the future**

Argüelles, C. A., Bustamante, Mauricio, Kheirandish, A., Palomares-Ruiz, S., Salgado, J. & Vincent, A. C., 19 Jul 2019, In: P o S - Proceedings of Science. 8 p.

### **Astrophysics Uniquely Enabled by Observations of High-Energy Cosmic Neutrinos**

Vieregg, A., Ackermann, M., Ahlers, Markus Tobias, Bustamante, Mauricio, Anchordoqui, L., Connolly, A., Deaconu, C., Grant, D., Gorham, P., Halzen, F., Karle, A., Kotera, K., Kowalski, M., Mostafa, M. A., Murase, K., Nelles, A., Olinto, A., Romero-Wolf, A. & Wissel, S., 31 May 2019, In: Bulletin of the American Astronomical Society. 51, 3, 26 p.

### **Fundamental Physics with High-Energy Cosmic Neutrinos**

Vieregg, A., Ackermann, M., Ahlers, Markus Tobias, Anchordoqui, L., Bustamante, Mauricio, Connolly, A., Deaconu, C., Grant, D., Gorham, P., Halzen, F., Karle, A., Kotera, K., Kowalski, M., Mostafa, M. A., Murase, K., Nelles, A., Olinto, A., Romero-Wolf, A. & Wissel, S., 31 May 2019, In: Bulletin of the American Astronomical Society. 51, 3, 24 p., 215.

### **Echo Technique to Distinguish Flavors of Astrophysical Neutrinos**

Li, S. W., Bustamante, Mauricio & Beacom, J. F., 16 Apr 2019, In: Physical Review Letters. 122, 15, 7 p., 151101.

### **Open Questions in Cosmic-Ray Research at Ultrahigh Energies**

Batista, R. A., Biteau, J., Bustamante, Mauricio, Dolag, K., Engel, R., Fang, K., Kampert, K., Kostunin, D., Mostafa, M., Murase, K., Sigl, G., Oikonomou, F., Olinto, A. V., Panasyuk, M. I., Taylor, A. & Unger, M., 15 Mar 2019, In: Frontiers in Astronomy and Space Sciences. 6, 35 p., 23.

### **Universe's Worth of Electrons to Probe Long-Range Interactions of High-Energy Astrophysical Neutrinos**

Bustamante, Mauricio & Agarwalla, S. K., 12 Feb 2019, In: Physical Review Letters. 122, 6, 8 p., 061103.

### **Inferring the flavor of high-energy astrophysical neutrinos at their sources**

Bustamante, Mauricio & Ahlers, Markus Tobias, 29 Jan 2019, In: Physical Review Letters. 122, 7 p., 241101.

### **Extracting the Energy-Dependent Neutrino-Nucleon Cross Section above 10 TeV Using IceCube Showers**

Bustamante, Mauricio & Connolly, A., 28 Jan 2019, In: Physical Review Letters. 122, 4, 9 p., 041101.

### **Unitarity bounds of astrophysical neutrinos**

Ahlers, Markus Tobias, Bustamante, Mauricio & Mu, S., 28 Dec 2018, In: Physical Review D. 98, 12, 8 p., 123023.

### **POEMMA: Probe Of Extreme Multi-Messenger Astrophysics**

Olinto, A. V., Adams, J. H., Aloisio, R., Anchordoqui, L. A., Bergman, D. R., Bertaina, M. E., Bertone, P., Bustamante, M., Christl, M. J., Csorna, S. E., Eser, J. B., Fenu, F., Guépin, C., Hays, E. A., Hunter, S., Judd, E., Jun, I., Kotera, K., Krizmanic, J. F., Kuznetsov, E. & 21 others, Mackovjak, S., Martinez-Sierra, L. M., Mastafa, M., Matthews, J. N., McEnery, J., Mitchell, J. W., Neronov, A., Otte, A. N., Parizot, E., Paul, T. C., Perkins, J. S., Prevot, G., Reardon, P., Reno, M. H., Sarazin, F., Shinozaki, K., Stecker, F., Streitmatter, R., Venters, T., Wiencke, L. & Young, R. M., 25 Aug 2018, In: P o S - Proceedings of Science. 301, 8 p., 542.

### **The Giant Radio Array for Neutrino Detection**

Martineau-Huynh, O., Bustamante, M., Carvalho, W., Charrier, D., Jong, S. D., Vries, K. D. D., Fang, K., Feng, Z., Finley, C., Gou, Q., Gu, J., Hu, H., Kotera, K., Coz, S. L., Medina, C., Murase, K., Niess, V., Oikonomou, F., Timmermans, C., Wang, Z. & 2 others, Wu, X. & Zhang, Y., 5 Feb 2017, In: E P J Web of Conferences. 135, 02001.

### **Constraints on the Ultra-High Energy Neutrino Flux from Gamma-Ray Bursts from a Prototype Station of the Askaryan Radio Array**

Allison, P., Auffenberg, J., Bard, R., Beatty, J. J., Besson, D. Z., Bora, C., Chen, C. -C., Chen, P., Connolly, A., Davies, J. P., DuVernois, M. A., Fox, B., Gorham, P. W., Hanson, K., Hill, B., Hoffman, K. D., Hong, E., Hu, L. -C., Ishihara, A., Karle, A. & 32 others, Kelley, J., Kravchenko, I., Landsman, H., Landrie, A., Li, C. -, Liu, T., Lu, M. -, Maunu, R., Mase, K., Meures, T., Miki, C., Nam, J., Nichol, R. J., Nir, G., O'Murchadha, A., Pfendner, C. G., Ratzlaff, K., Rotter, B., Sandstrom, P., Seckel, D., Shultz, A., Song, M., Stockham, J., Stockham, M., Sullivan, M., Touart, J., Tu, H. -, Varner, G. S., Yoshida, S., Young, R., Bustamante, Mauricio & Guetta, D., 1 Feb 2017, In: Astroparticle Physics. 88, p. 7-16

### **Testing decay of astrophysical neutrinos with incomplete information**

Bustamante, Mauricio, Beacom, J. F. & Murase, K., 6 Oct 2016, In: Physical Review D. 95, 063013.

### **Cosmogenic Neutrinos Challenge the Cosmic Ray Proton Dip Model**

Heinze, J., Boncioli, D., Bustamante, Mauricio & Winter, W., 11 Jul 2016, In: The Astrophysical Journal. 825, 2, 122.

### **Multi-messenger light curves from gamma-ray bursts in the internal shock model**

Bustamante, Mauricio, Heinze, J., Murase, K. & Winter, W., 7 Jun 2016, In: *Astrophysical Journal*. 837, 33.

### **Searching for cavities of various densities in the Earth's crust with a low-energy electron-antineutrino beta-beam**

Argüelles, C. A., Bustamante, Mauricio & Gago, A. M., 15 Jul 2015, In: *Modern Physics Letters A*. 30, 29, 1550146.

### **Theoretically palatable flavor combinations of astrophysical neutrinos**

Bustamante, Mauricio, Beacom, J. F. & Winter, W., 8 Jun 2015, In: *Physical Review Letters*. 115, 161302.

### **Neutrino and cosmic-ray emission from multiple internal shocks in gamma-ray bursts**

Bustamante, Mauricio, Baerwald, P., Murase, K. & Winter, W., 9 Sep 2014, In: *Nature Communications*. 6, 6783.

### **UHE neutrino and cosmic ray emission from GRBs: revising the models and clarifying the cosmic ray-neutrino connection**

Bustamante, Mauricio, Baerwald, P. & Winter, W., 6 Feb 2014, In: *AIP Conference Proceedings*. 1630, 1

### **Are gamma-ray bursts the sources of ultra-high energy cosmic rays?**

Baerwald, P., Bustamante, Mauricio & Winter, W., 8 Jan 2014, In: *Astrophysical Journal*. 62, p. 66-91

### **Escape and propagation of UHECR protons and neutrons from GRBs, and the cosmic ray-neutrino connection**

Bustamante, Mauricio, Baerwald, P. & Winter, W., 12 Jun 2013, In: *Brazilian Journal of Physics*. 44

### **UHECR escape mechanisms for protons and neutrons from GRBs, and the cosmic ray-neutrino connection**

Baerwald, P., Bustamante, Mauricio & Winter, W., 25 Jan 2013, In: *Astrophysical Journal*. 768, 186.

### **Neutrino Decays over Cosmological Distances and the Implications for Neutrino Telescopes**

Baerwald, P., Bustamante, Mauricio & Winter, W., 22 Aug 2012, In: *Journal of Cosmology and Astroparticle Physics*. 2012

### **SUSY Renormalization Group Effects in Ultra High Energy Neutrinos**

Bustamante, Mauricio, Gago, A. M. & Jones-Perez, J., 13 Dec 2010, In: *Journal of High Energy Physics*. 2011, 05, 133.

### **IceCube expectations for two high-energy neutrino production models at active galactic nuclei**

Argüelles, C. A., Bustamante, Mauricio & Gago, A. M., 8 Aug 2010, In: *Journal of Cosmology and Astroparticle Physics*. 2010, 12, 005.

### **Energy-independent new physics in the flavour ratios of high-energy astrophysical neutrinos**

Bustamante, Mauricio, Gago, A. M. & Pena-Garay, C., 27 Jan 2010, In: *Journal of High Energy Physics*. 2010, 066

### **Beyond the Standard Model for Montaneros**

Bustamante, Mauricio, Cieri, L. & Ellis, J., 23 Nov 2009

### **High energy astrophysical neutrino flux and modified dispersion relations**

Alba, J. L. B., Bustamante, Mauricio, Gago, A. M. & Miranda, O. G., 11 Jul 2009, In: *International Journal of Modern Physics A*. 24, 31, 5819.

### **Extreme scenarios of new physics in the UHE astrophysical neutrino flavour ratios**

Bustamante, Mauricio, Gago, A. M. & Pena-Garay, C., 29 Jun 2009, In: *Journal of Physics: Conference Series*. 171, 012048.

## **Activities**

### **TeV Particle Astrophysics 2017**

Bustamante, Mauricio (Participant)

7 Aug 2017 → 11 Aug 2017

**Advances in Space Research (Journal)**

Bustamante, Mauricio (Editor)

2017 → ...

**Astrophysical Journal (Journal)**

Bustamante, Mauricio (Editor)

2015 → ...

**International Journal of Modern Physics A (Journal)**

Bustamante, Mauricio (Editor)

2015 → ...

**Physical Review D - Particles, Fields, Gravitation and Cosmology (Journal)**

Bustamante, Mauricio (Editor)

2015 → ...

**Physical Review Letters (Journal)**

Bustamante, Mauricio (Editor)

2015 → ...