

Emmanuel Fonseca – Curriculum Vitae

Assistant professor (starting Fall 2021)
West Virginia University
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Research Areas

Radio pulsars: high-precision pulsar timing; orbital dynamics; neutron-star mass measurements; gravitational radiation and pulsar timing arrays; pulsar instruments for next-generation telescopes.

Fast radio bursts: algorithm and hardware development for detection, characterization and localization; modeling of burst morphology.

Education

Ph.D. in Astronomy	2012 - 2016
School: University of British Columbia (UBC)	
Advisor: Ingrid H. Stairs	
Thesis: <i>Mass and Geometric Measurements of Binary Radio Pulsars</i>	
M. Sc. in Astronomy	2010 - 2012
School: UBC	
Advisor: Ingrid H. Stairs	
Thesis: <i>Experimental Gravity with PSR B1534+12</i>	
B. Sc in Physics, Astronomy (dual degrees; minor in Math)	2006 - 2010
School: Pennsylvania State University (PSU)	
Advisors: Stephen Holland, Scott Koch, Erik Hoversten	

Employment

Assistant professor (West Virginia University; WVU)	starting Fall 2021
Postdoctoral researcher (McGill)	2016 - 2021
Graduate research assistant (UBC)	2010 - 2016
Research intern (NASA Goddard Space Flight Center)	2009, 2010
Undergraduate research assistant (PSU)	2008 - 2010

Teaching/Outreach Positions

Public outreach assistant (PSU, UBC, McGill)	2009 - present
Laboratory Instructor, Science Creative Literacy Symposium (UBC)	2014 - 2016
Graduate teaching assistant (UBC)	2010 - 2016

Recent Presentations

Colloquia and Conference Talks/Posters

- “High-Cadence Timing of Radio Pulsars with CHIME.” Invited talk for the April 2020 Meeting of the American Physical Society. Remote presentation. 17-20 April 2021.
- “FRB Astrophysics in the Era of CHIME.” Invited colloquium for the Kavli Institute for Cosmological Physics at the University of Chicago. 6 December 2019.
- “Pulsar & FRB Astrophysics in the Era of CHIME.” Invited astronomy colloquium at Northwestern University. 3 December 2019.
- “A GPU-enabled, Pulsar-Timing Backend for the Canadian Hydrogen Intensity Mapping Experiment.” Invited talk at the Dominion Radio Astrophysical Observatory in Kaleden, British Columbia (Canada), 4 June 2019.
- “FRB Detection & Characterization at the Dawn of the CHIME Era.” Invited talk for the URSI National meeting in Boulder, Colorado (USA), 9-12 January 2019.
- “The NANOGrav Nine-Year Data Set: Mass and Geometric Measurements of Binary Millisecond Pulsars.” Invited talk for the JINA-CEE international symposium on *Neutron Stars in the Multi-Messenger Era: Prospects and Challenges* in Athens, Ohio (USA), 23-27 May 2016.

Public Outreach Talks

- “Monsters in the Darkroom: Imaging the Event Horizons of Black Holes.” Talk for Astronomy on Tap in Montreal, QC, 27 March 2018.
- “The Warped Road of Einstein’s General Relativity.” Talk for the Public Astro Night at McGill University, 14 December 2017.
- “Seeing Gravity and the (Invisible) Universe.” TEDx talk for Terry Project, UBC, 2 November 2013.

Successful Proposals:

Telescopes

- 300-m Arecibo Observatory: 1000+ hours as PI (e.g., P2945, P3183, P3228)
- 100-m Green Bank Telescope: 30+ hours as PI (e.g., 14A-421, 18B-280, 19A-411)
- Karl G. Jansky Very Large Array: 3.5 hours as PI (20A-474)

Professional Activities & Service

Membership

- International Pulsar Timing Array (IPTA) 2012 - present
- N. A. Nanohertz Observatory for Gravitational Waves (NANOGrav) 2012 - present
- Canadian Astronomical Society (CASCA) 2011 - present
- Canadian Hydrogen Intensity Mapping Experiment (CHIME) 2016 - present

Conference Organization:

- CASCA 2019: member of local organizing committee; designer of conference website.
- NANOGrav spring 2017 meeting: member of science organizing committee (SOC)
- NANOGrav spring 2015 meeting: member of the science-meeting SOC.
- CASCA 2013: co-organizer of grad-student workshop, general conference assistant.

Committees:

- IPTA Diversity Committee (2016 - 2019)
- hiring committee for staff scientists at the Arecibo Observatory (2018)

Publication Referee:

- the Astrophysical Journal
- the Monthly Notices of the Royal Astronomical Society

Press Coverage

The Conversation:

invitation to write article(s) on CHIME/FRB backends

Scientific American:

article on first CHIME/FRB detection (13 August 2018)

CBC Radio Canada:

recorded telephone interview on first CHIME/FRB detection, in spanish (8 August 2018)

Publication List for E. Fonseca

Academic, Peer Reviewed

72. **Fonseca, E.**, Cromartie, H. T., Pennucci, T. T., et al. “Refined Mass and Geometric Measurements of the High-Mass PSR J0740+6620.” *The Astrophysical Journal Letters*, *in press*. May/June 2021. arXiv:2104.00880
71. Nimmo, K., Hessels, J. W. T., Kirsten, F., et al. “Burst timescales and luminosities link young pulsars and fast radio bursts.” *Submitted to Nature*. May 2021. arXiv:2105.11446.
70. Kirsten, F., Marcote, B., Nimmo, K., et al. “A repeating fast radio burst source in a globular cluster.” *Submitted to Nature*. May 2021. arXiv:2105.11445.
69. Riley, T. E., Watts, A. L., Ray, P. S., et al. “A NICER View of the Massive Pulsar PSR J0740+6620 Informed by Radio Timing and XMM-Newton Spectroscopy.” *Submitted to the Astrophysical Journal Letters*. April 2021. arXiv:2105.06980.
68. Miller, M. C., Lamb, F. K., Dittmann, A. J., et al. “The Radius of PSR J0740+6620 from NICER and XMM-Newton Data.” *Submitted to the Astrophysical Journal Letters*. April 2021. arXiv:2105.06979
67. The NANOGrav Collaboration: Arzoumanian, Z., Baker, P. T., Blumer, H., et al. “Searching For Gravitational Waves From Cosmological Phase Transitions With The NANOGrav 12.5-year dataset.” *Submitted to the Physical Review Letters*. April 2021. arXiv:2104.13930.
66. Wahl, H. M., McLaughlin, M. A., Gentile, P. A., et al., “The NANOGrav 12.5-Year Data Set: Polarimetry, Rotation Measures, and Galactic Magnetic Field Strengths from NANOGrav Observations with the Green Bank Telescope.” *Submitted to the Astrophysical Journal*. April 2021. arXiv:2104.05723.
65. Pol, N. S., Taylor, S. R., Kelley, L. Z., et al. “Astrophysics Milestones For Pulsar Timing Array Gravitational Wave Detection.” *The Astrophysical Journal Letters*, 911, L34. April 2021.
64. Pleunis, Z., Michilli, D., Bassa, C. G., et al. “LOFAR Detection of 110-188 MHz Emission and Frequency-dependent Activity from FRB 20180916B.” *The Astrophysical Journal Letters*, 911, L3. April 2021.
63. Bhardwaj, M., Gaensler, B. M., Kaspi, V. M., et al. “A Nearby Repeating Fast Radio Burst in the Direction of M81.” *The Astrophysical Journal Letters*, 910, L18. April 2021.
62. Pleunis, Z., Good, D. C., Kaspi, V. M., et al. “Fast radio burst morphology in the first CHIME/FRB catalog.” *Submitted to the Astrophysical Journal*. March 2021.

61. Tendulkar, S. P., Gil de Paz, A., Kirichenko, A. Yu., et al. “The 60-pc Environment of FRB 20180916B.” *The Astrophysical Journal Letters*, 908, L12. February 2021.
60. Agazie, G., Mingyar, M., McLaughlin, M. A., et al. “The Green Bank Northern Celestial Cap Pulsar Survey. VI. Timing and Discovery of PSR J1759+5036: A Double Neutron Star Binary Pulsar.” *Submitted to the Astrophysical Journal*. February 2021. arXiv:2102.10214.
59. The CHIME/FRB Collaboration: Amiri, M., Andersen, B. C., Bandura, K., et al. “The First CHIME/FRB Fast Radio Burst Catalog.” *Submitted to the Astrophysical Journal Supplements*. January 2021.
58. The NANOGrav Collaboration: Alam, M. F., Arzoumanian, Z., Baker, P. T., et al. “The NANOGrav 12.5-year Data Set: Wideband Timing of 47 Millisecond Pulsars.” *The Astrophysical Journal Supplements*, 252, 5. January 2021.
57. The NANOGrav Collaboration: Alam, M. F., Arzoumanian, Z., Baker, P. T., et al. “The NANOGrav 12.5-year Data Set: Observations and Narrowband Timing of 47 Millisecond Pulsars.” *The Astrophysical Journal Supplements*, 252, 4. January 2021.
56. Arzoumanian, Z., Baker, P. T., Blumer, H., et al. “The NANOGrav 12.5 yr Data Set: Search for an Isotropic Stochastic Gravitational-wave Background.” *The Astrophysical Journal Letters*, 905, L34. December 2020.
55. Good, D. C., Andersen, B. C., Chawla, P., et al. “First discovery of new pulsars and RRATs with CHIME/FRB.” *Submitted to the Astrophysical Journal*. December 2020. arXiv:2012.02320.
54. Parent, É., Chawla, P., Kaspi, V. M., et al. “First Discovery of a Fast Radio Burst at 350 MHz by the GBNCC Survey.” *The Astrophysical Journal*, 904, 92. December 2020.
53. Ng, C., Wu, B., Ma, M. et al. “The Discovery of Nulling and Mode Switching Pulsars with CHIME/Pulsar.” *The Astrophysical Journal*, 903, 81 November 2020.
52. The CHIME/FRB Collaboration: Andersen, B. C. Bandura, K. M., Bhardwaj, M., et al. “A bright millisecond-duration radio burst from a Galactic magnetar.” *Nature*, 587, 54-58. November 2020.
51. The NANOGrav Collaboration: Arzoumanian, Z., Baker, P. T., Brazier, A., et al. “Multi-Messenger Gravitational Wave Searches with Pulsar Timing Arrays: Application to 3C66B Using the NANOGrav 11-year Data Set.” *The Astrophysical Journal*, 900, 102. September 2020.
50. The CHIME/Pulsar Collaboration: Amiri, M., Bandura, K., Boyle, P. J., et al. “The CHIME Pulsar Project: System Overview.” *Submitted to the Astrophysical Journal Supplements*. August 2020. arXiv:2008.05681.

49. The CHIME/FRB Collaboration: Amiri, M., Andersen, B. C., Bandura, K., et al. “Periodic Activity from a Fast Radio Burst Source.” *Nature*, 582, 351-354. June 2020.
48. Ng, C., Pandhi, A., Naidu, A., et al. “Faraday rotation measures of northern-hemisphere pulsars using CHIME/Pulsar.” *Monthly Notices of the Royal Astronomical Society*, 496, 2836. June 2020.
47. Chawla, P., Andersen, B. C., Bhardwaj, M., et al. “Detection of Repeating FRB 180916.J0158+65 Down to Frequencies of 300 MHz.” *The Astrophysical Journal Letters*, 896, L41. June 2020.
46. Behrens, E. A., Ransom, S. M., Madison, D. R., et al. “The NANOGrav 11 yr Data Set: Constraints on Planetary Masses Around 45 Millisecond Pulsars.” *The Astrophysical Journal Letters*, 893, L8. April 2020.
45. Vallisneri, M., Taylor, S. R., Simon, J., et al. “Modeling the Uncertainties of Solar System Ephemerides for Robust Gravitational-wave Searches with Pulsar-timing Arrays.” *The Astrophysical Journal*, 893, 112. April 2020.
44. **Fonseca, E.**, Andersen, B. C., Bhardwaj, M., et al. “Nine New Repeating Fast Radio Burst Sources from CHIME/FRB.” *The Astrophysical Journal Letters*, 891, L6. February 2020.
43. Kirichenko, A. Yu., Karpova, A. V., Zyuzin, D. A., et al. “Searching for optical companions to four binary millisecond pulsars with the Gran Telescopio Canarias.” *Monthly Notices of the Royal Astronomical Society*, 492, 3032. February 2020.
42. Hazboun, J. S., Simon, J., Taylor, S. R., et al. “The NANOGrav 11 yr Data Set: Evolution of Gravitational-wave Background Statistics.” *The Astrophysical Journal*, 890, 108. February 2020.
41. Marcote, B., Nimmo, K., Hessels, J. W. T., et al. “A repeating fast radio burst source localised to a nearby spiral galaxy.” *Nature*, 577, 190. January 2020.
40. Cromartie, H. T., **Fonseca, E.**, Ransom, S. M., et al. “A very massive neutron star: relativistic Shapiro delay measurements of PSR J0740+6620.” *Nature Astronomy*, 4, 72. January 2020.
39. The NANOGrav Collaboration: Aggarwal, K., Arzoumanian, Z., Baker, P. T., et al., “The NANOGrav 11 yr Data Set: Limits on Gravitational Wave Memory.” *The Astrophysical Journal*, 889, 38. January 2020.
38. Perera, B. B. P., DeCesar, M. E., Demorest, P. B., et al. “The International Pulsar Timing Array: second data release.” *Monthly Notices of the Royal Astronomical Society*, 490, 4666. December 2019.

37. The CHIME/FRB Collaboration: Andersen, B., Bandura, K., Bhardwaj, M., et al. “CHIME /FRB Discovery of Eight Repeating Fast Radio Burst Sources” *Astrophysical Journal Letters*, 855, L24. September 2019. (Corresponding author: **Fonseca, E.**)
36. Josephy, A., Chawla, P., **Fonseca, E.**, et al. “CHIME/FRB Detection of the Original Repeating Fast Radio Burst Source FRB 121102.” *The Astrophysical Journal Letters*, 882, L18. September 2019.
35. The NANOGrav Collaboration: Aggarwal, K., Arzoumanian, Z., Baker, P. T., et al. “The NANOGrav 11 yr Data Set: Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries.” *The Astrophysical Journal*, 880, 116. August 2019.
34. Aloisi, R. J., Cruz, A., Daniels, L., et al. “The Green Bank North Celestial Cap Pulsar Survey. IV. Four New Timing Solutions.” *The Astrophysical Journal*, 875, 19. April 2019.
33. Deneva, J. S., Ray, P. S., Lommen, A., et al. “High-precision X-Ray Timing of Three Millisecond Pulsars with NICER: Stability Estimates and Comparison with Radio.” *The Astrophysical Journal*, 874, 160. April 2019.
32. Lam, M. T., McLaughlin, M. A., Arzoumanian, Z., et al. “The NANOGrav 12.5 yr Data Set: The Frequency Dependence of Pulse Jitter in Precision Millisecond Pulsars.” *The Astrophysical Journal*, 872, 193. February 2019.
31. Madison, D. R., Cordes, J. M., Arzoumanian, Z., et al. “The NANOGrav 11 yr Data Set: Solar Wind Sounding through Pulsar Timing.” *The Astrophysical Journal*, 872, 150. February 2019.
30. The CHIME/FRB Collaboration: Amiri, M., Bandura, K., Bhardwaj, M., et al. “A Second Source of Repeating Fast Radio Bursts.” *Nature*, 566, 235-238. January 2019.
29. The CHIME/FRB Collaboration: Amiri, M., Bandura, K., Bhardwaj, M., et al. “Observations of Fast Radio Bursts at Frequencies down to 400 MHz.” *Nature*, 566, 230-234. January 2019.
28. Zhu, W. W., Desvignes, G., Wex, N., et al. “Tests of gravitational symmetries with pulsar binary J1713+0747.” *Monthly Notices of the Royal Astronomical Society*, 482, 3249. January 2019.
27. Stovall, K., Freire, P. C. C., Antoniadis, J. et al. “PSR J2234+0611: A New Laboratory for Stellar Evolution.” *The Astrophysical Journal*, 870, 74. January 2019.
26. Caballero, R. N., Guo, Y. J., Lee, K. J., et al. “Studying the Solar system with the International Pulsar Timing Array.” *Monthly Notices of the Royal Astronomical Society*, 481, 5501. December 2018.

25. Brook, P. R., Karastergiou, A., McLaughlin, M. A., et al. “The NANOGrav 11-year Data Set: Pulse Profile Variability.” *The Astrophysical Journal*, 868, 122. December 2018.
24. The CHIME/FRB Collaboration: Amiri, M., Bandura, K., Berger, P., et al. “The CHIME Fast Radio Burst Project: System Overview.” *The Astrophysical Journal*, 863, 48. August 2018.
23. Gentile, P. A., McLaughlin, M. A., Demorest, P. B., et al. “The NANOGrav 11 yr Data Set: Arecibo Observatory Polarimetry and Pulse Microcomponents.” *The Astrophysical Journal*, 862, 47. July 2018.
22. Lam, M. T., Ellis, J. A., Grillo, G., et al. “A Second Chromatic Timing Event of Interstellar Origin toward PSR J1713+0747.” *The Astrophysical Journal*, 861, 132. July 2018.
21. Lynch, R. S., Swiggum, J. K., Kondratiev, V. I., et al. “The Green Bank North Celestial Cap Survey II: 45 New Pulsar Timing Solutions.” *The Astrophysical Journal*, 859, 2. June 2018.
20. The NANOGrav Collaboration: Arzoumanian, Z., Brazier, A., Burke-Spolaor, S., et al. “The NANOGrav Eleven-Year Data Set: Pulsar-timing Constraints On The Stochastic Gravitational-wave Background.” *The Astrophysical Journal*, 859, 47. May 2018.
19. The NANOGrav Collaboration: Arzoumanian, Z., Brazier, A., Burke-Spolaor, S., et al. “The NANOGrav Eleven-Year Data Set: High-precision timing of 45 Millisecond Pulsars.” *The Astrophysical Journal (Supplement)*, 235, 37. April 2018.
18. Kawash, A. M., McLaughlin, M. A., Kaplan, D. L., et al. “The Green Bank North Celestial Cap Survey II: The Discovery and Timing of Ten Pulsars.” *The Astrophysical Journal*, 857, 131. April 2018.
17. Jones, M. L., McLaughlin, M. A., Lam, M. T., et al. “The NANOGrav Nine-Year Data Set: Measurement and Interpretation of Variations in Dispersion Measures.” *The Astrophysical Journal*, 841, 125. June 2017.
16. Lam, M. T., Cordes, J. M., Chatterjee, S., et al. “The NANOGrav Nine-Year Data Set: Excess Noise in Millisecond Pulsar Arrival Times.” *The Astrophysical Journal*, 834, 35. January 2017.
15. **Fonseca, E.**, Pennucci, T. T., Ellis, J. A., et al. “The NANOGrav Nine-Year Data Set: Mass and Geometric Measurements of Binary Millisecond Pulsars.” *The Astrophysical Journal*, 832, 167. December 2016.
14. Kaplan, D. L., Kupfer, T., Nice, D. J., et al. “PSR J1024-0719: A Millisecond Pulsar in an Unusual Long-Period Orbit.” *The Astrophysical Journal*, 826, 86. July 2016.

13. Lentati, L., Shannon, R. M., Coles, W. A., et al. “From spin noise to systematics: stochastic processes in the first International Pulsar Timing Array data release.” *Monthly Notices of the Royal Astronomical Society*, 458, 2161. May 2016.
12. Verbiest, J. P. W., Lentati, L., Hobbs, G., et al. “The International Pulsar Timing Array: First data release.” *Monthly Notices of the Royal Astronomical Society*, 458, 1267. May 2016.
11. The NANOGrav Collaboration: Arzoumanian, Z., Brazier, A., Burke-Spolaor, S., et al. “The NANOGrav Nine-Year Data Set: Limits on the Isotropic Stochastic Gravitational Wave Background.” *The Astrophysical Journal*, 821, 13. April 2016.
10. Lam, M. T., Cordes, J. M., Chatterjee, S., et al. “The NANOGrav Nine-Year Data Set: Noise Budget for Pulse Arrival Times on Intraday Timescales.” *The Astrophysical Journal*, 819, 155. March 2016.
9. Levin, L., McLaughlin, M. A., Jones, G., et al. “The NANOGrav Nine-Year Data Set: Monitoring Interstellar Scattering Delays.” *The Astrophysical Journal*, 818, 166. February 2016.
8. Matthews, A. M., Nice, D. J., **Fonseca, E.**, et al. “The NANOGrav Nine-Year Data Set: Astrometric Measurements of 37 Millisecond Pulsars.” *The Astrophysical Journal*, 818, 92. February 2016.
7. The NANOGrav Collaboration: Arzoumanian, Z., Brazier, A., Burke-Spolaor, S., et al. “The NANOGrav Nine-Year Data Set: Observations, Arrival Time Measurements and Analysis of 37 Millisecond Pulsars.” *The Astrophysical Journal*, 813, 65. November 2015.
6. Arzoumanian, Z., Brazier, A., Burke-Spolaor, S., et al. “NANOGrav Constraints on Gravitational Wave Bursts with Memory.” *The Astrophysical Journal*, 810, 150. September 2015.
5. Zhu, W. W., Stairs, I. H., Demorest, P. B., et al. “21-Year Timing of Millisecond pulsar PSR J1713+0747 with Arecibo and GBT.” *The Astrophysical Journal*, 809, 41. August 2015.
4. **Fonseca, E.**, Stairs, I. H., and Thorsett, S. E. “A Comprehensive Study of Relativistic Gravity using PSR B1534+12.” *The Astrophysical Journal*, 787, 82. May 2014.
3. Holland, S. T., Sbarufatti, B., Shen, R., et al. “GRB 090417B and its host galaxy: a step towards an understanding of optically-dark gamma-ray bursts.” *The Astrophysical Journal*, 717, 223. July 2010.

Academic, White Papers

2. **Fonseca, E.**, et al. “Fundamental Physics with Pulsars.” October 2019. (Contribution to the 2020-2030 Long Range Plan for the Canadian Astronomical Society.)
1. **Fonseca, E.**, Demorest, P. B., Ransom, S. M., Stairs, I. H. “Fundamental Physics with Radio Millisecond Pulsars.” *Bulletin of the American Astronomical Society*, 51, 425. May 2019. (Contribution to the Astro2020 U. S. Decadal Survey on Astronomy & Astrophysics.)