Dr. Marco Cavaglia, PhD

Professor of Physics
Department of Physics, Missouri University of Science and Technology

Mail address: Physics Department, Missouri University of Science and Technology
1315 N. Pine St., Rolla, MO 65409, USA
Telephone: +1(573)341-4781
Email: cavagliam@mst.edu
Web: http://people.mst.edu/faculty/cavagliam/

Contents

NOTE: Accomplishments since joining Missouri S&T are indicated in color throughout the document.

National Press Club, Washington, D.C., February 16th, 2016. Selected representatives of the LIGO Scientific Collaboration announcing the first direct detection of gravitational waves "proving Einstein's right." Marco Cavaglia is in the first row, fifth from left. Rainer Weiss, who was awarded the 2017 Physics Nobel Prize for this "discovery that shook the world," is also in the first row, third from left.

Most important accomplishments

- **Published 268 peer-reviewed research articles** (14 as single author, 76 since joining Missouri S&T) including **2 prestigious Nature and 27 Physical Review Letters (6 since joining Missouri S&T)**.[1]
- **Co-author of 29 top-cited papers** (17 with 1000+ citations, 3 since joining Missouri S&T), including the paper about the **first discovery of gravitational waves (8975 citations)** and the paper about the **first multi-messenger observation of colliding neutron stars (6513 citations)**.[1]
- **Total citations: 73,234 (16,707 since joining Missouri S&T)**.[1]
- **h-index: 100 (41 since joining Missouri S&T)**.[1]
- **Continuous funding from National Science Foundation since 2008, totaling more than 3.1 million USD (1 million USD since joining Missouri S&T).**[2]
- **Seven major international research awards (1 since joining Missouri S&T)** shared with the 2017 Physics Nobel Prize awardees Rainer Weiss (MIT), Kip S. Thorne (Caltech), and Barry C. Barish (Caltech), and the colleagues of the LIGO Scientific Collaboration (LSC) including the **2016 Special Breakthrough Prize** for the detection of gravitational waves and the **2016 Gruber Cosmology Prize**.
- **Served for five years (2012 – 2017) as elected assistant spokesperson of the LSC.** Co-directed the work of 1000+ people in 100+ institutions during the first detection era.
- **Elected co-chair of the LSC Burst Sources Working Group,** the second largest data analysis group in the collaboration (2019 – present).
- **Founding chair of the LSC Diversity Committee** (2012 – 2015).
- **Founding chair of the LSC Education and Public Outreach Working Group** (2008 – 2012).
- **Won the 2022 Faculty Excellence Award and the 2020 Faculty Research Award at Missouri S&T.**

[1] Source: https://inspirehep.net, accessed 02/05/2023.
[2] Source: https://nsf.gov, accessed 02/05/2023.

Education

- **October 1996: Ph.D. in astrophysics**. International School for Advanced Studies (SISSA), Trieste, Italy. Title of dissertation: *Quantisation of Gauge Systems: Application to Minisuperspace Models in Canonical Quantum Gravity*. Supervisor: Professor Dennis W. Sciama. External supervisor: Professor Vittorio de Alfaro (University of Turin). External examiner: Professor Carlo Rovelli (Aix-Marseille University).
- **November 1992 – October 1996: Graduate school in astrophysics.** International School for Advanced Studies (SISSA). All exams passed with honors. From December 1994 to November 1995: Italian National Community Service.
- **July 1992: *Laurea* (M.Sc.-equivalent) in physics**. University of Torino. Title of dissertation: *Anisotropic Electromagnetic Wormholes*. Graduating marks: 110/110 summa cum laude and honorable mention.
- **1988 – 1992: B.S/M.Sc. course in physics**. University of Turin. All exams passed with honors (GPA equivalent: 4.1).

Appointments

- **Since January 2019: Professor of physics with tenure.** Physics Department, Missouri University of Science & Technology, USA.
- **July 2017 – December 2018: Professor of physics and astronomy with tenure.** Department of Physics and Astronomy, University of Mississippi, USA.
- **July 2010 – June 2017: Associate professor of physics and astronomy with tenure.** Department of Physics and Astronomy, University of Mississippi, USA.
- **January 2004 – June 2010: Assistant professor of physics and astronomy (tenure-track).** Department of Physics and Astronomy, University of Mississippi, USA.
- **October 2002 – September 2003: Lecturer.** Institute of Cosmology and Gravitation, University of Portsmouth, U.K.
- **September 2000 – August 2002: Bruno Rossi postdoctoral fellow**. Center for Theoretical Physics, M.I.T., Cambridge MA, USA.
- **October 1999 – August 2000: Postdoctoral research associate.** Department of Physics, University of Beira Interior, Covilhã, Portugal.
- **September 1997 – September 1999: Postdoctoral research associate.** Max-Planck-Institut für Gravitationsphysik, Albert-Einstein-Institut, Golm, Germany.
- **January 1997 – August 1997: Postdoctoral research associate.** Tufts University, Department of Physics and Astronomy, Medford MA, USA.

Other academic positions

- **Visiting professor.** Institute for Pure and Applied Mathematics, University of California-Los Angeles (September 2021 – December 2021).
- **Adjunct professor.** Department of Physics and Astronomy, University of Mississippi, USA (January 2019 – December 2020).
- **Visiting scientist.** California Institute of Technology, LIGO Laboratory. November 2007 – May 2009 and February – June 2015.

- **Graduate faculty**. University of Alabama. Academic years 2007 – 08 and 2014 – 15.
- **Adjunct professor.** Department of Physics and Astronomy, University of Mississippi, USA. October – December 2003.
- **Visiting professor.** Department of Theoretical Physics, University of Torino, Italy. October – December 2003.

Honors and professional awards

- **2022 Faculty Excellence Award.** Missouri University S&T.
- **2020 Faculty Research Award.** Missouri University S&T.
- **2019 National Air and Space Museum's Current Achievement Trophy.** Shared with the LIGO Collaboration.
- **2017 Princess of Asturias Award for Technical and Scientific Research.** Shared with Rainer Weiss (MIT), Kip S. Thorne (Caltech) and Barry C. Barish (Caltech), and the LIGO Scientific Collaboration.
- **2017 AAS – Bruno Rossi Prize.** Shared with Gabriela Gonzalez (main recipient) and the LIGO Scientific Collaboration.
- **2016 AAS Science Breakthrough of the year.** Shared with the LIGO Scientific Collaboration.
- **2016 National Space Club Huntsville Distinguished Science Award.** Shared with the LIGO Scientific Collaboration.
- **2016 Special Breakthrough Prize for the detection of gravitational waves.** Shared with Ron Drever (Caltech), Kip S. Thorne (Caltech), Rainer Weiss (MIT), and the LIGO Scientific Collaboration.
- **2016 Gruber Cosmology Prize.** Shared with Ron Drever (Caltech), Kip S. Thorne (Caltech), Rainer Weiss (MIT), and the LIGO Scientific Collaboration.
- **Honorable Mention. 2003 Gravity Research Foundation.** Shared with E.-J. Ahn (University of Chicago).
- **Third Prize. 2002 Gravity Research Foundation.** Shared with E.-J. Ahn (University of Chicago).

Research grants

Active

- **September 2022 – August 2024 (estimated)**: *Collaborative Research: A Partnership in Central Missouri in the Era of Multi-messenger Astrophysics* (AST-2219212). PI: S. Saito (67% effort), Co-PI: M. Cavaglia (33% effort). Granting agency: National Science Foundation. Amount to date: 135,116 USD.
- **August 2020 – July 2023 (estimated)**: *WoU-MMA: Enabling Multi-Messenger Astrophysics with Advanced LIGO: from Detector Calibration to Interpretation of Gravitational-Wave Signals* (PHY-2011334). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 465,025 USD.

Total amount of active external awards: 600,141 USD.

Expired

- **January 2019 – January 2022**: *Improving Data Quality of Advanced LIGO Gravitational-Wave Searches* (PHY-1921006). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 398,453 USD.
- **August 2014 – July 2019**: *Mississippi's Contribution to Advanced LIGO's Search for Gravitational Waves* (PHY-1404139). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 375,000 USD.
- **July 2011 – June 2015**: *Mississippi Participation in LIGO's Search for Gravitational Waves: Getting Ready for Advanced LIGO* (PHY-1067985). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 343,038 USD.
- **April 2009 – March 2015**: *Catching a New Wave: Gravitational-wave Astronomy as a Probe of the Universe* (PHY-0852870). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 950,237 USD.
- **July 2008 – 2011**: *Mississippi's participation in LIGO's search for gravitational waves* (PHY-0757937). PI: M. Cavaglia (100% effort). Granting agency: National Science Foundation. Amount: 260,160 USD.

Total amount of expired external awards: 2,326,888 USD.

Table of awards and expenditures at Missouri S&T (2019 – present)

FY	**Award number**	**Awarded** (USD)	**Expended** (USD)	**Credit**
2023	NSF AST-2219212	125,636.00	89.45	33%
2022	NSF PHY-2011334	247,980.00	146,306.02	100%
2022	NSF PHY-1921006	0.00	23,654.49	100%
2021	NSF PHY-2011334	137,966.00	24,749.87	100%
2021	NSF PHY-1921006	50,272.00	109,437.08	100%
2020	NSF PHY-2011334	79,079.00	0	100%
2020	NSF PHY-1921006	120,000.00	212,878.17	100%
2019	NSF PHY-1921006	228,181.00	13,854.86	100%

Current and past research activities

Most of professor Cavaglia's research activity has been devoted to the study of experimental and theoretical gravitational-wave detection, classical and quantum models of gravity, high energy cosmic rays, cosmology and applied mathematics.

Post-doc supervision and mentoring

- **Dr. Sudarshan Karki,** Post-doctoral research associate, Missouri S&T (2019 – 2022).
- **Dr. Ryan Quitzow-James,** Post-doctoral research associate, Missouri S&T (2019 – 2022).
- **Dr. Evan Goetz,** Post-doctoral research associate, Missouri S&T (2019).
- **Dr. Shivaraj Khandasamy,** Post-doctoral research associate, University of Mississippi (2013 – 2016 and 2018).
- **Dr. Alexander Dietz,** Post-doctoral research associate, University of Mississippi (2011 – 2012).
- **Dr. Vitor Cardoso,** Post-doctoral research associate, University of Mississippi (2005 – 2008).

Graduate student supervision

Current

- **Dishari Malakar**, graduate student, Missouri S&T (2022 – present).
- **Syeda Nasim**, graduate student, Missouri S&T (2021 – present).
- **Sushant Chaudhary Sharma**, Ph.D. candidate, Missouri S&T (2020 – present).
- **Yanyan Zheng**, Ph.D. candidate, Missouri S&T (2019 – present).

Completed with degree

- **Dr. Dripta Bhattacharjee**, Ph.D., Missouri S&T (2017 – 2021). Title of dissertation: *Reduced calibration uncertainties for the global network of gravitational-wave observatories and the impact on sky localization of burst-like sources.*
- **Dr. Kentaro Mogushi**, Ph.D., Missouri S&T (2016 – 2021). Title of dissertation: *Improving the Data Quality in Gravitational-wave Detectors by Mitigating Transient Noise Artifacts.*
- **Dr. Shaoqi Hou**, Ph.D. in Physics, University of Alabama (2010 – 2016). Principal advisor: Dr. Benjamin Harms, University of Alabama. Title of dissertation: *Bounds on large extra dimensions from the simulation of black hole events at the Large Hadron Collider.*
- **Cody Arceneaux**, M.Sc., University of Mississippi (2011 – 2015). Title of dissertation: *FScan Code Development for LIGO Detector Characterization.*
- **Brooke A. Rankins**, M.Sc., University of Mississippi (2007 – 2011). Title of dissertation: *DQTunePipe: A set of Python tools for LIGO detector characterization.*
- **Dr. Arunava Roy**, Ph.D., University of Mississippi (2005 – 2009). Title of dissertation: *Particle Phenomenology of Gravitational Events at the TeV Scale.*

Other graduate student supervision

- **Emma Lockyer**, graduate student, Missouri S&T (2021 – 2022).
- **Sumeet Kulkarni**, M.Sc. candidate, University of Mississippi (2017 – 19).
- **Jericho Cain**, University of Mississippi (2006 – 2009).
- **Jun-Qi Guo**, M.Sc., University of Mississippi (2005 – 2008).

Undergraduate student supervision and mentoring

Current

- **Giovanna Lenza**, 2022 OURE, B.S. in Physics, Missouri S&T (2022 – present).
- **Jackson Marlett**, 2022 OURE, B.S. in Physics, Missouri S&T(2022 – present).
- **Yashasvi Moon**, B.S. in Physics, Missouri State University (2022 – present).
- **Rachel Lee**, B.S. in Physics, Missouri State University (2022 – present).

Past

- **Mason Labrot**, B.S. in Physics, Missouri S&T (2020 – 2021).
- **Alexander Love**, B.S. in Physics, 2021 FYRE Fellow, S&T (2020).
- **Matthew Miller**, B.S. in Physics, Missouri S&T (2020).
- **Nathaniel Page**, B.S. in Physics, Missouri S&T (2020).
- **Elizabeth Caputa-Hatley**, B.S. in Physics, 2020 MOSGC NASA Fellow, Missouri S&T (2019 – 2020).
- **Jacob McQuerrey**, B.S. in Physics, 2020 FYRE Fellow, Missouri S&T (2019 – 2020).
- **Ethan Hisle**, B.S. in Physics, Missouri S&T (2019 – 2020).
- **Francesca Attadio**, M.Sc. in Physics, University of Rome "La Sapienza", Italy (2022).
- **Alfonso Corrado**, B.S. in Physics, University of Naples, Italy (2019).
- **Hunter Gabbard**, B.S. in Physics, Honors College, University of Mississippi (2013 - 2016). Title of dissertation: *A Study on the Characterization and Implementation of Tools for Advanced LIGO.*
- **Daniel Duddleston**, B.S. in Physics, Honors College, University of Mississippi (2013 - 2014). Title of dissertation: *Detector Characterization Analysis of the Initial Laser Interferometer Gravitational-wave Obervatory using Principal Component Analysis.*
- **Giorgio Nicolini**, M.Sc. in Physics, University of Pisa (2018).
- **Luciano Errico**, M.Sc. in Physics, University of Naples (2016).
- **Nicola De Lillo**, M.Sc. in Physics, University of Trento (2016).
- **Martina Adamo**, M.Sc. in Physics, University of Naples (2015).
- **Michele Valentini**, M.Sc. in Physics, University of Trento (2015).
- **Olmo Cerri**, M.Sc. in Physics, University of Pisa (2014).
- **Camillo Cocchieri**, M.Sc. in Physics, University of Pisa (2014).
- **Giovanni Rabuffo**, M.Sc. in Physics, University of Pisa (2013).
- **Daniele Trifirò**, M.Sc. in Physics, University of Pisa (2012 - 2017).
- **Domizia Chericoni**, M.Sc. in Physics, University of Pisa (2012).
- **Andrew W. Watson**, B.S. in Physics, Moravian College (2011).
- **Fabrizia Canfora**, M.Sc. in Physics, University of Naples (2011).
- **Carlo Enrico Petrillo**, M.Sc. in Physics, University of Naples (2011).
- **Alessandro Manzotti**, M.Sc. in Physics, University of Parma (2011).
- **Michele Mancarella**, M.Sc. in Physics, University of Pisa (2010).
- **Laura Torino**, M.Sc. in Physics, University of Pisa (2010).

Other noteworthy selected student mentorship

Current

- **Faculty advisor.** Missouri S&T Women in Physics Campus Organization (2022 – present).
- **Faculty advisor.** Missouri S&T Astronomical Research Society – STARS (2022 – present).
- **Financial officer.** Missouri S&T Women in Physics APS award UM-0066918 (2021 – present).

Past

- **Research mentor.** High-school student Vikram Bhamre, London, U.K. (2020 – 2022).
- **Research mentor.** High-school student Cole Johnson, Washington, D.C. (2020 – 2021).
- **Research mentor.** High-school student Ashini Modi, Shreveport, LA (2019 – 2021).
- **External examiner.** Dr. Ronaldas Macas' Ph.D. Viva examination, Cardiff University (2020).
- **Research mentor.** High-school student Teerth Gill, Prescott, AZ (2018 – 2019).

Teaching experience

Since 1997, professor Cavaglia has taught a variety of courses at undergraduate and graduate level at prestigious U.S. and foreign higher-education institutions:

Undergraduate courses

- Astronomy (Tufts University, Missouri S&T).
- Astrophysics (University of Mississippi, Missouri S&T).
- Cosmology (Portsmouth University, UK, University of Mississippi).
- Electromagnetic Theory (University of Mississippi).
- Engineering Physics (University of Mississippi, Missouri S&T).
- Fluids and Electromagnetic Waves (Portsmouth University, UK).
- General Physics (University of Mississippi).
- General Relativity (University of Mississippi).
- Interdisplinary Science for non-STEM Majors (University of Mississippi).
- Mathematical Physics (University of Mississippi).
- Physics for Pharmaceutical Sciences (University of Mississippi).
- Quantum Mechanics (University of Mississippi).
- Relativistic Astrophysics (Portsmouth University, UK).
- Selected Topics in Physics (University of Mississippi, Missouri S&T).
- Stellar Structure (Portsmouth University, UK , University of Mississippi).

Graduate courses

- Advanced Electromagnetic Theory (University of Mississippi).
- Advanced Quantum Mechanics (MIT).
- Constrained Systems and Quantum Gravity (University of Mississippi, Max Planck Institute for Gravitational Physics, Germany),

- General Relativity (University of Mississippi).
- Quantum Field Theory (University of Mississippi).
- Research Seminar (University of Mississippi).
- Special Topics (University of Mississippi, Max Planck Institute for Gravitational Physics, Germany, Missouri S&T).
- String Theory (University of Mississippi).

Other scientific activities

Conference and long-program event organization

- **Organizing committee chair.** BIRS 2024 workshop *Detection and analysis of gravitational waves in the era of multi-messenger astronomy: From mathematical modelling to machine learning.* Banff, Canada, November 17 – 22, 2024. Funded through competitive proposal.
- **Organizing committee chair.** *Midwest Session of the Conference for Undergraduate Women in Physics (CUWIP).* Missouri S&T, January 2024. Funded through competitive proposal.
- **Organizing committee.** Semester-long program *Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy.* Institute for Pure and Applied Mathematics, UCLA (2021). Semester-long visiting scientist at UCLA with institutional support for teaching replacement "buyout." Funded through competitive proposal.
- **Organizing committee chair.** BIRS 2021 workshop *Detection and analysis of gravitational waves in the era of multi-messenger astronomy: From mathematical modelling to machine learning*, Oaxaca, Mexico, Nov 14 – 19, 2021. Funded through competitive proposal.
- **Organizing committee.** *Computational Challenges in Gravitational Wave Astronomy* workshop, Institute for Pure and Applied Mathematics, UCLA, January 28 - February 2, 2019.
- **Organizing committee.** *Southeastern Session of the Conference for Undergraduate Women in Physics (CUWIP),* University of Mississippi, January 16 – 18, 2015. Funded through competitive proposal.
- **Organizing committee.** *Second Mediterranean Conference on Classical and Quantum Gravity (MCCQG-2),* Veli Lošinj, (Croatia) June 9 – 15, 2013.
- **Organizing committee.** *First Mediterranean Conference on Classical and Quantum Gravity (MCCQG),* Kolymbari, Crete (Gr-eece) September 14 – 18, 2009.
- **Organizing committee.** *Seventh Gulf Coast Gravity Meeting*, University of Mississippi, April 19 – 20, 2011.
- **Organizing committee chair.** *Fourth Gulf Coast Gravity Meeting*, University of Mississippi, March 7 – 8, 2008.
- **Organizing committee chair.** *Second School and Workshop on gravity and theoretical physics,* University of Mississippi, January 8 – 11, 2007.
- **Organizing committee chair.** *First Minischool on Quantum Gravity for graduate students,* University of Mississippi, January 9 – 13, 2006.
- **Organizing committee.** *Fourth Meeting on Constrained Dynamics and Quantum Gravity (QG05),* Cala Gonone, Sardinia (Italy) September 12 – 16, 2005.
- **Organizing committee.** *Third Meeting on Constrained Dynamics and Quantum Gravity (QG99),* Villasimius (Italy) September 13 – 17, 1999.
- **Organizing committee.** *Second conference on Constrained Dynamics and Quantum Gravity*

(QG96), Santa Margherita Ligure (Italy), September 17 – 21, 1996.
- **Organizing committee.** *International Meeting on Constrained Dynamics and Quantum Gravity,* Dubna, Russia, July 5 – 7, 1995.

Institutional activities

- **Founding director.** Institute of Multi-messenger Astrophysics and Cosmology, Missouri S&T (2019 – present).
- **Founding director.** Center of Multi-messenger Astrophysics, University of Mississippi (2018).

Other synergistic activities

- **Cooperating member and representative for the United States.** European Cost Action 17137: "A network for Gravitational Waves, Geophysics and Machine Learning."
- **Grant reviewer and panelist.** Funding agencies: U.S. National Science Foundation, Department of Energy, NASA, Research Corporation for Science Advancement, South Africa National Research Foundation, Swiss National Foundation, Japan Society for the Promotion of Science, Georgia Shota Rustaveli National Science Foundation, Netherlands Organisation for Scientific Research, Oak Ridge Associated Universities.
- **Rapporteur.** European COST Action scientific program (2019 – present).
- **Editorial board.** Universe (October 2018 – present).
- **Editorial advisory panel.** Classical and Quantum Gravity (March 2009 – 2018).
- **Referee.** American Journal of Physics, Annals of Physics, Astroparticle Physics, Astrophysical Journal, Astrophysics and Space Science, Cambridge University Press, Classical and Quantum Gravity, Entropy, European Physical Journal C, Foundations of Physics Letters, General Relativity and Gravitation, International Journal of Modern Physics A, International Journal of Modern Physics D, International Journal of Theoretical Physics, Journal of Cosmology and Astrophysics, Modern Physics Letters A, Nuclear Physics B, Physics Letters A, Physics Letters B, Physical Review D, Physical Review Letters, Universe.
- **Reviewer.** American Mathematical Society (Mathematical Reviews). More than 200 papers and two books reviewed.
- **committee chair.** Physics and Astronomy Departmental Colloquia, University of Mississippi, spring semester 2006-07, fall semester 2008-09.

Research publications and talks

Overview

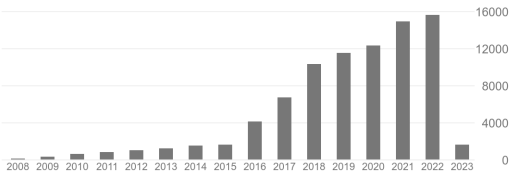
Professor Cavaglia, over the last 30 years of your academic career:

- Authored 268 published articles in peer-reviewed journals. 29 of these are top-cited papers with over 500 citations.
- Published 22 articles in conference proceedings.
- Authored 24 other scientific publications.
- Co-edited 5 conference proceedings books.

- Delivered over 150 invited and contributed talks at universities in the U.S. and around the world.

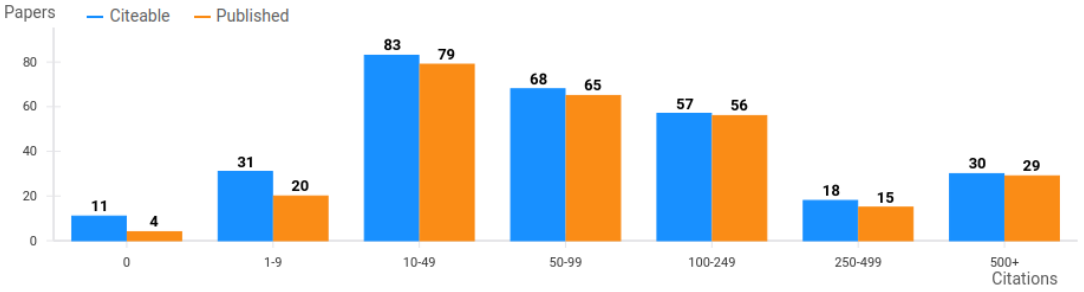
Publication metrics

	All	Since 2018
Citations	86501	66384
h-index	108	83
i10-index	251	205



Publication metrics from Google Scholar (February 5, 2022):

Papers	298	268
Citations	75,490	73,234
h-index	102	100
Citations/paper (avg)	253.3	273.3



Publication metrics from INSPIRE-HEP (February 5, 2023)

Selected noteworthy broader impact activities

LIGO Scientific Collaboration service and management

- **Co-chair (elected).** LIGO Scientific Collaboration Burst Sources Working Group (2019 – present).
- **Member.** LIGO Scientific Collaboration Management Team (2020 – 2021 and 2022 – present).
- **Senior member (elected).** LIGO Scientific Collaboration Academic Advisory committee (2018 – 2021).
- **Member.** Institutional review panel committee of the LIGO Scientific Collaboration (2009 – present).
- **Assistant Spokesperson (elected).** LIGO Scientific Collaboration (2012 – 2017.
- **Member.** LIGO Scientific Collaboration Executive committee (January 2012 – 2017).
- **Founding chair.** LIGO Scientific Collaboration Diversity committee (2012 – 2015).

- **Founding chair.** LIGO Education and Public Outreach Working Group (2008 – 2012).
- **Member.** LIGO Scientific Collaboration stochastic group review committee (2008 – 2011).
- **Founding co-editor.** LIGO Magazine, Online ISSN: 2169-4443, Publisher: LIGO Scientific Collaboration, Pasadena, CA, USA, World Wide Web URL: https://www.ligo.org/magazine/ (2012 – 2017).

Missouri S&T service

- **Physics department graduate admissions committee** (2020 – present).
- **Physics department long range planning committee** (2019 – present).
- **Physics department tenure and promotion committee** (2019 – present).
- **Campus tenure committee** (2019 – present).
- **Contributor.** Physics department annual newsletters (2020 – present).
- **Dean's research task force** (2022).
- **Faculty senate** (2021 – 2022).
- **Physics department salary and wage committee** (2021).
- **Physics department committee for exceptional astrophysics hire** (2020).
- **Campus S&T data science center proposal committee** (2020).
- **Computer science TT hiring committee** (2019).
- **Panelist.** Campus early career awards workshop (2019).

Education and public outreach for the LIGO Scientific Collaboration

- **Event organizer and chair.** LIGO-Missouri S&T participation in the St. Louis "Science and Engineering Expo," St. Louis Science Center, February 2023.
- **Event organizer and chair.** LIGO-Missouri S&T participation in the St. Louis "The Great Outdoors" Science Festival, St. Louis Science Center, May 2022.
- **Event organizer and chair.** LIGO-Missouri S&T participation in the St. Louis "Science and Engineering Expo," St. Louis Science Center, February 2022.
- **Event organizer and chair.** LIGO-Missouri S&T participation in the St. Louis "Science and Engineering Expo," St. Louis Science Center, February 2020.
- **PI and project chair.** LIGO broader impact project "Astronomy's New Messengers" (2009 – 2015). Nationwide tour of the LIGO exhibits to over two dozens of educational institutions and science museums across the U.S. and participation to the NYC 2009-10 World Science Festivals. Funded through NSF award PHY-0852870.
- **Scientific consultant.** Science documentary film *"LIGO: A Passion for Understanding"* by Over The Sun LLC, Director: Kai Staats, 2014, IMDB: https://www.imdb.com/title/tt3829486/.
- **Associate producer and scientific consultant.** Science documentary film *"LIGO: Detection"* by Over The Sun LLC, Director: Kai Staats, 2017, IMDB: https://www.imdb.com/title/tt6778612/.
- **Producer, scientific consultant, and PI (through NSF award PHY-1067985).** Science documentary film *"LIGO: Generations"* by Over The Sun LLC, Director: Kai Staats, 2015 IMDB: https://www.imdb.com/title/tt6778568/.

- **Event organizer.** LIGO Scientific Collaboration participation in the 2009 Joint Annual Meeting of the NSBP+NSHP.
- **Event organizer and chair.** LIGO Scientific Collaboration participation in the Aspen (CO) Street Science Festival, August 2013.
- **Event organizer.** LIGO Scientific Collaboration participation in the USA Science and Engineering Expo, Washington D.C., April 2012.
- **Event organizer and chair.** LIGO Scientific Collaboration participation in the USA Science and Engineering Expo, Washington D.C., October 2010.
- **Event organizer and chair.** LIGO's 100 Hours of Astronomy webcast *Around the World in 80 Observatories* (April 2009).
- **External evaluator.** IREU program in gravitational-wave physics of the University of Florida (2009).
- **Event organizer and chair.** Graduate student visits to the Gravitational Wave Observatory LIGO, Livingston LA, April 2006, April 2008, and January 2017.
- **Event organizer and chair.** Tour and activities for Oxford School District students on the occasion of the display of the LIGO Traveling Exhibit at the University of Mississippi Museum. Coordinated after-school activities with kids.
- **Director and PI.** Production of LIGO's "amazing fact" on NASA's outreach website Space Place. Written a companion column and article published on Astronomy Club Newsletters and magazines across the U.S.

Other education and public outreach

- **Public lectures and outreach initiatives.** Countless STEM educational and outreach events in schools, libraries and museums, associations and festivals (2004 – present).
- **Founder, event organizer and chair.** *Oxford Science Café*, free monthly conversations about science open to the public (October 2012 – 2018).
- **Founder, event organizer and chair.** Halloween Physics Nights (Spooky Physics Demonstrations). University of Mississippi (2007 – 2018).
- **Local organization and event chair.** March for Science. Oxford, Mississippi, April 22, 2017.
- **Organizing committee chair and instructor.** Teacher development workshop "Waves here there everywhere" for teachers grade 6-12 (June 6 – 7, 2016) in collaboration with the University of Mississippi Center for Mathematics and Science Education.
- **Local organization.** International year of Astronomy celebrations. University of Mississippi (2009).
- **Event organizer and performer.** Concerts of the Mockingbird Ensemble "Music of the Spheres." University Museum (November 8, 2009) and All Saints Episcopal Church, Memphis (November 9, 2009). Translator and on-stage reader of Galileo and Kepler writings. Designed event's stage set for the concerts.
- **Event organizer and chair.** Two public interdisciplinary concerts by renowned composer and percussionist Andrea Centazzo. University of Mississippi (Nutt Auditorium, February 5 – 6, 2009).
- **Event organizer and chair.** Picture exhibition *The World at Night.* University of Mississippi Library (March 31 – April 30, 2009).
- **Event organizer**. *The Artist's Universe* exhibition. University of Mississippi's Museum

(2009).

- **Scientific consultant.** Einstein Online (Max-Planck Institut Outreach Program); Scienza per tutti (INFN Outreach Program); National Geographic science documentary film by director Thomas Lucas; National Geographic KIDS Magazine, Astronomy Magazine.

Membership in professional societies

- American Physical Society (APS).
- International Astronomical Union (IAU).
- American Association for the Advancement of Science (AAAS).

Appendix A: List of publications

Published peer-reviewed articles

1. R. Abbott *et al.* [LIGO Scientific, KAGRA and VIRGO], "Model-based Cross-correlation Search for Gravitational Waves from the Low-mass X-Ray Binary Scorpius X-1 in LIGO O3 Data," Astrophys. J. Lett. **941**, no.2, L30 (2022) doi:10.3847/2041-8213/aca1b0 [arXiv:2209.02863 [astro-ph.HE]].

2. R. Abbott *et al.* [KAGRA, LIGO Scientific and VIRGO], "Search for continuous gravitational wave emission from the Milky Way center in O3 LIGO-Virgo data," Phys. Rev. D **106**, no.4, 042003 (2022) doi:10.1103/PhysRevD.106.042003 [arXiv:2204.04523 [astro-ph.HE]].

3. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "First joint observation by the underground gravitational-wave detector KAGRA with GEO 600," PTEP **2022**, no.6, 063F01 (2022) doi:10.1093/ptep/ptac073 [arXiv:2203.01270 [gr-qc]].

4. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data," Phys. Rev. D **106**, no.6, 062002 (2022) doi:10.1103/PhysRevD.106.062002 [arXiv:2201.10104 [gr-qc]].

5. M. Cavaglia, "Characterization of gravitational-wave detector noise with fractals," Class. Quant. Grav. **39**, no.13, 135012 (2022) doi:10.1088/1361-6382/ac7325 [arXiv: 2201.09984 [gr-qc]].

6. R. Abbott *et al.* [KAGRA, LIGO Scientific and VIRGO], "All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data," Phys. Rev. D **106**, no.10, 102008 (2022) doi:10.1103/PhysRevD. 106.102008 [arXiv:2201.00697 [gr-qc]].

7. R. Abbott *et al.* [LIGO Scientific, KAGRA and VIRGO], "Narrowband Searches for Continuous and Long-duration Transient Gravitational Waves from Known Pulsars in the LIGO-Virgo Third Observing Run," Astrophys. J. **932**, no.2, 133 (2022) doi:10.3847/1538-4357/ac6ad0 [arXiv:2112.10990 [gr-qc]].

8. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data," Phys. Rev. D **105**, no.10, 102001 (2022) doi:10.1103/PhysRevD.105.102001 [arXiv:2111.15507 [astro-ph.HE]].

9. R. Abbott *et al.* [LIGO Scientific and VIRGO], "Search of the early O3 LIGO data for continuous gravitational waves from the Cassiopeia A and Vela Jr. supernova remnants," Phys. Rev. D **105**, no.8, 082005 (2022) doi:10.1103/PhysRevD.105.082005 [arXiv:2111.15116 [gr-qc]].

10. R. Abbott *et al.* [LIGO Scientific, VIRGO and KAGRA], "Searches for Gravitational Waves from Known Pulsars at Two Harmonics in the Second and Third LIGO-Virgo Observing Runs," Astrophys. J. **935**, no.1, 1 (2022) doi:10.3847/1538-4357/ac6acf [arXiv:2111.13106 [astro-ph.HE]].

11. J. M. Antelis, M. Cavaglia, T. Hansen, M. D. Morales, C. Moreno, S. Mukherjee, M. J. Szczepańczyk and M. Zanolin, "Using supervised learning algorithms as a follow-up method in the search of gravitational waves from core-collapse supernovae," Phys. Rev. D **105**, no.8, 084054 (2022) doi:10.1103/PhysRevD.105.084054 [arXiv:2111.07219 [gr-qc]].

12. R. Abbott *et al.* [LIGO Scientific, VIRGO and KAGRA], "Search for Gravitational Waves Associated with Gamma-Ray Bursts Detected by Fermi and Swift during the LIGO–Virgo Run O3b," Astrophys. J. **928**, no.2, 186 (2022) doi:10.3847/1538-4357/ac 532b [arXiv:2111.03608 [astro-ph.HE]].

13. R. Abbott *et al.* [KAGRA, Virgo and LIGO Scientific], "All-sky, all-frequency directional search for persistent gravitational waves from Advanced LIGO's and Advanced Virgo's first three observing runs," Phys. Rev. D **105**, no.12, 122001 (2022) doi:10.1103/PhysRevD.105.122001 [arXiv:2110.09834 [gr-qc]].

14. R. Abbott *et al.* [LIGO Scientific, VIRGO and KAGRA], "Search for Subsolar-Mass Binaries in the First Half of Advanced LIGO's and Advanced Virgo's Third Observing Run," Phys. Rev. Lett. **129**, no.6, 061104 (2022) doi:10.1103/PhysRevLett.129.061104 [arXiv:2109.12197 [astro-ph.CO]].

15. R. Abbott *et al.* [LIGO Scientific, VIRGO and KAGRA], "Search for continuous gravitational waves from 20 accreting millisecond x-ray pulsars in O3 LIGO data," doi:10.1103/PhysRevD.105.022002 [arXiv:2109.09255 [astro-ph.HE]].

16. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "All-sky search for long-duration gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run," Phys. Rev. D **104**, no.10, 102001 (2021) doi:10.1103/PhysRevD.104.102001 [arXiv:2107.13796 [gr-qc]].

17. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "All-sky search for short gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run," Phys. Rev. D **104**, no.12, 122004 (2021) doi:10.1103/PhysRevD.104.122004 [arXiv:2107.03701 [gr-qc]].

18. R. Abbott *et al.* [KAGRA, VIRGO and LIGO Scientific], "All-sky search for continuous gravitational waves from isolated neutron stars in the early O3 LIGO data," Phys. Rev. D **104**, no.8, 082004 (2021) doi:10.1103/PhysRevD.104.082004 [arXiv:2107.00600 [gr-qc]].

19. R. Abbott *et al.* [LIGO Scientific, KAGRA and VIRGO], "Observation of Gravitational Waves from Two Neutron Star–Black Hole Coalescences," Astrophys. J. Lett. **915**, no.1, L5 (2021) doi:10.3847/2041-8213/ac082e [arXiv:2106.15163 [astro-ph.HE]].

20. R. Abbott *et al.* [LIGO Scientific, VIRGO and KAGRA], "Search for intermediate-mass black hole binaries in the third observing run of Advanced LIGO and Advanced Virgo," Astron. Astrophys. **659**, A84 (2022) doi:10.1051/0004-6361/202141452 [arXiv:2105.15120 [astro-ph.HE]].

21. R. Abbott *et al.* [LIGO Scientific, KAGRA and Virgo], "Constraints on dark photon dark matter using data from LIGO's and Virgo's third observing run," Phys. Rev. D **105**, no.6, 063030 (2022) doi:10.1103/PhysRevD.105.063030 [arXiv:2105.13085 [astro-ph.CO]].

22. R. Abbott *et al.* [LIGO Scientific, VIRGO, KAGRA and Virgo], "Searches for Continuous Gravitational Waves from Young Supernova Remnants in the Early Third Observing Run of Advanced LIGO and Virgo," Astrophys. J. **921**, no.1, 80 (2021) doi:10.3847/1538-4357/ac17ea [arXiv:2105.11641 [astro-ph.HE]].

23. R. Abbott *et al.* [LIGO Scientific and VIRGO], "Search for Lensing Signatures in the Gravitational-Wave Observations from the First Half of LIGO-Virgo's Third Observing Run," Astrophys. J. **923**, no.1, 14 (2021) doi:10.3847/1538-4357/ac23db [arXiv: 2105.06384 [gr-qc]].

24. R. Abbott *et al.* [LIGO Scientific, Virgo and KAGRA], "Constraints from LIGO O3 Data on Gravitational-wave Emission Due to R-modes in the Glitching Pulsar PSR J0537–6910," Astrophys. J. **922**, no.1, 71 (2021) doi:10.3847/1538-4357/ac0d52 [arXiv:2104.14417 [astro-ph.HE]].

25. M. Szczepanczyk, J. Antelis, M. Benjamin, M. Cavaglia, D. Gondek-Rosinska, T. Hansen, S. Klimenko, M. Morales, C. Moreno and S. Mukherjee, *et al.* "Detecting and reconstructing gravitational waves from the next galactic core-collapse supernova in the advanced detector era," Phys. Rev. D **104**, no.10, 102002 (2021) doi:10.1103/PhysRev D.104.102002 [arXiv:2104.06462 [astro-ph.HE]].

26. R. Abbott *et al.* [KAGRA, Virgo and LIGO Scientific], "Search for anisotropic gravitational-wave backgrounds using data from Advanced LIGO and Advanced Virgo's first three observing runs," Phys. Rev. D **104**, no.2, 022005 (2021) doi:10.1103/PhysRevD. 104.022005 [arXiv:2103.08520 [gr-qc]].

27. R. Abbott *et al.* [KAGRA, Virgo and LIGO Scientific], "Upper limits on the isotropic gravitational-wave background from Advanced LIGO and Advanced Virgo's third observing run," Phys. Rev. D **104**, no.2, 022004 (2021) doi:10.1103/PhysRevD.104.022004 [arXiv:2101.12130 [gr-qc]].

28. R. Abbott *et al.* [LIGO Scientific, Virgo and KAGRA], "Constraints on Cosmic Strings Using Data from the Third Advanced LIGO–Virgo Observing Run," Phys. Rev. Lett. **126**, no.24, 241102 (2021) doi:10.1103/PhysRevLett.126.241102 [arXiv:2101.12248 [gr-qc]].

29. K. Mogushi, R. Quitzow-James, M. Cavaglià, S. Kulkarni and F. Hayes, "NNETFIX: an artificial neural network-based denoising engine for gravitational-wave signals," Mach. Learn. Sci. Tech. **2**, no.3, 035018 (2021) doi:10.1088/2632-2153/abea69 [arXiv:2101.04712 [gr-qc]].

30. R. Abbott *et al.* [LIGO Scientific, Virgo and KAGRA], "Diving below the Spin-down Limit: Constraints on Gravitational Waves from the Energetic Young Pulsar PSR J0537-6910," Astrophys. J. **913**, L27 (2021) doi:10.3847/2041-8213/abffcd [arXiv:2012.12926 [astro-ph.HE]].

31. R. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky search in early O3 LIGO data for continuous gravitational-wave signals from unknown neutron stars in binary systems," Phys. Rev. D **103**, no.6, 064017 (2021) doi:10.1103/PhysRevD.103.064017 [arXiv:2012.12128 [gr-qc]].

32. R. Abbott *et al.* [LIGO Scientific and Virgo], "Population Properties of Compact Objects from the Second LIGO-Virgo Gravitational-Wave Transient Catalog," Astrophys. J. Lett. **913**, no.1, L7 (2021) doi:10.3847/2041-8213/abe949 [arXiv:2010.14533 [astro-ph.HE]].

33. R. Abbott *et al.* [LIGO Scientific and Virgo], "GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run," Phys. Rev. X **11**, 021053 (2021) doi:10.1103/PhysRevX.11.021053 [arXiv:2010.14527 [gr-qc]].

34. R. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Gravitational Waves Associated with Gamma-Ray Bursts Detected by Fermi and Swift During the LIGO-Virgo Run O3a," Astrophys. J. **915**, no.2, 86 (2021) doi:10.3847/1538-4357/abee15 [arXiv:2010.14550 [astro-ph.HE]].

35. R. Abbott *et al.* [LIGO Scientific and Virgo], "Tests of general relativity with binary black holes from the second LIGO-Virgo gravitational-wave transient catalog," Phys. Rev. D **103**, no.12, 122002 (2021) doi:10.1103/PhysRevD.103.122002 [arXiv:2010.14529 [gr-qc]].

36. R. Abbott *et al.* [LIGO Scientific and Virgo], "GW190521: A Binary Black Hole Merger with a Total Mass of $150M_{\odot}$," Phys. Rev. Lett. **125**, no.10, 101102 (2020) doi:10.1103/PhysRevLett.125.101102 [arXiv:2009.01075 [gr-qc]].

37. R. Abbott *et al.* [LIGO Scientific and Virgo], "Properties and Astrophysical Implications of the 150 $M_{\odot}$ Binary Black Hole Merger GW190521," Astrophys. J. Lett. **900**, no.1, L13 (2020) doi:10.3847/2041-8213/aba493 [arXiv:2009.01190 [astro-ph.HE]].

38. B. M. Frank, B. Piotrzkowski, B. Bolen, M. Cavaglià and S. L. Larson, "Modeling spurious forces on the LISA spacecraft across a full solar cycle," Class. Quant. Grav. **37**, no.17, 175007 (2020) doi:10.1088/1361-6382/ab9bba

39. R. Abbott *et al.* [LIGO Scientific and Virgo], "Gravitational-wave Constraints on the Equatorial Ellipticity of Millisecond Pulsars," Astrophys. J. Lett. **902**, no.1, L21 (2020) doi:10.3847/2041-8213/abb655 [arXiv:2007.14251 [astro-ph.HE]].

40. R. Abbott *et al.* [LIGO Scientific and Virgo], "GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object," Astrophys. J. Lett. **896**, no.2, L44 (2020) doi:10.3847/2041-8213/ab960f [arXiv:2006.12611 [astro-ph.HE]].

41. M. Cavaglia and A. Modi, "Two-dimensional correlation function of binary black hole coalescences," Universe **6**, no.7, 93 (2020) doi:10.3390/universe6070093 [arXiv: 2005.06004 [astro-ph.HE]].

42. R. Abbott *et al.* [LIGO Scientific and Virgo], "GW190412: Observation of a Binary-Black-Hole Coalescence with Asymmetric Masses," Phys. Rev. D **102**, no.4, 043015 (2020) doi:10.1103/PhysRevD.102.043015 [arXiv:2004.08342 [astro-ph.HE]].

43. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW190425: Observation of a Compact Binary Coalescence with Total Mass $\sim 3.4M_{\odot}$," Astrophys. J. Lett. **892**, no.1, L3 (2020) doi:10.3847/2041-8213/ab75f5 [arXiv:2001.01761 [astro-ph.HE]].

44. R. Hamburg *et al.* [Fermi Gamma-ray Burst Monitor Team, LIGO Scientific and Virgo], "A Joint Fermi-GBM and LIGO/Virgo Analysis of Compact Binary Mergers From the First and Second Gravitational-wave Observing Runs," Astrophys. J. **893**, 100 (2020) doi:10.3847/1538-4357/ab7d3e [arXiv:2001.00923 [astro-ph.HE]].

45. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "A guide to LIGO–Virgo detector noise and extraction of transient gravitational-wave signals," Class. Quant. Grav. **37**, no.5, 055002 (2020) doi:10.1088/1361-6382/ab685e [arXiv:1908.11170 [gr-qc]].

46. B. P. Abbott *et al.* [LIGO Scientific, Virgo and VIRGO], "A Gravitational-wave Measurement of the Hubble Constant Following the Second Observing Run of Advanced LIGO and Virgo," Astrophys. J. **909**, no.2, 218 (2021) doi:10.3847/1538-4357/abdcb7 [arXiv:1908.06060 [astro-ph.CO]].

47. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Optically targeted search for gravitational waves emitted by core-collapse supernovae during the first and second observing runs of advanced LIGO and advanced Virgo," Phys. Rev. D **101**, no.8, 084002 (2020) doi:10.1103/PhysRevD.101.084002 [arXiv:1908.03584 [astro-ph.HE]].

48. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Model comparison from LIGO–Virgo data on GW170817's binary components and consequences for the merger remnant," Class. Quant. Grav. **37**, no.4, 045006 (2020) doi:10.1088/1361-6382/ab5f7c [arXiv: 1908.01012 [gr-qc]].

49. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Eccentric Binary Black Hole Mergers with Advanced LIGO and Advanced Virgo during their First and Second Observing Runs," Astrophys. J. **883**, no.2, 149 (2019) doi:10.3847/1538-4357/ab3c2d [arXiv:1907.09384 [astro-ph.HE]].

50. B. P. Abbott *et al.* [LIGO Scientific, Virgo and IPN], "Search for gravitational-wave signals associated with gamma-ray bursts during the second observing run of Advanced LIGO and Advanced Virgo," Astrophys. J. **886**, 75 (2019) doi:10.3847/1538-4357/ab4b48 [arXiv:1907.01443 [astro-ph.HE]].

51. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "Search for gravitational waves from Scorpius X-1 in the second Advanced LIGO observing run with an improved hidden Markov model," Phys. Rev. D **100**, no.12, 122002 (2019) [erratum: Phys. Rev. D **104**, no.10, 109903 (2021)] doi:10.1103/PhysRevD.104.109903 [arXiv:1906.12040 [gr-qc]].

52. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for intermediate mass black hole binaries in the first and second observing runs of the Advanced LIGO and Virgo network," Phys. Rev. D **100**, no.6, 064064 (2019) doi:10.1103/PhysRevD.100.064064 [arXiv:1906.08000 [gr-qc]].

53. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-Sky Search for Short Gravitational-Wave Bursts in the Second Advanced LIGO and Advanced Virgo Run," Phys. Rev. D **100**, no.2, 024017 (2019) doi:10.1103/PhysRevD.100.024017 [arXiv:1905.03457 [gr-qc]].

54. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Subsolar Mass Ultracompact Binaries in Advanced LIGO's Second Observing Run," Phys. Rev. Lett. **123**, no.16, 161102 (2019) doi:10.1103/PhysRevLett.123.161102 [arXiv:1904.08976 [astro-ph.CO]].

55. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky search for long-duration gravitational-wave transients in the second Advanced LIGO observing run," Phys. Rev. D **99**, no.10, 104033 (2019) doi:10.1103/PhysRevD.99.104033 [arXiv:1903.12015 [gr-qc]].

56. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Directional limits on persistent gravitational waves using data from Advanced LIGO's first two observing runs," Phys. Rev. D **100**, no.6, 062001 (2019) doi:10.1103/PhysRevD.100.062001 [arXiv:1903.08844 [gr-qc]].

57. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Searches for Gravitational Waves from Known Pulsars at Two Harmonics in 2015-2017 LIGO Data," Astrophys. J. **879**, no.1, 10 (2019) [erratum: Astrophys. J. **899**, no.2, 170 (2020)] doi:10.3847/1538-4357/ab20cb [arXiv:1902.08507 [astro-ph.HE]].

58. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Tests of General Relativity with the Binary Black Hole Signals from the LIGO-Virgo Catalog GWTC-1," Phys. Rev. D **100**, no.10, 104036 (2019) doi:10.1103/PhysRevD.100.104036 [arXiv:1903.04467 [gr-qc]].

59. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for the isotropic stochastic background using data from Advanced LIGO's second observing run," Phys. Rev. D **100**, no.6, 061101 (2019) doi:10.1103/PhysRevD.100.061101 [arXiv:1903.02886 [gr-qc]].

60. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO O2 data," Phys. Rev. D **100**, no.2, 024004 (2019) doi:10.1103/PhysRevD.100.024004 [arXiv:1903.01901 [astro-ph.HE]].

61. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Narrow-band search for gravitational waves from known pulsars using the second LIGO observing run," Phys. Rev. D **99**, no.12, 122002 (2019) doi:10.1103/PhysRevD.99.122002 [arXiv:1902.08442 [gr-qc]].

62. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Transient Gravitational-wave Signals Associated with Magnetar Bursts during Advanced LIGO's Second Observing Run," Astrophys. J. **874**, no.2, 163 (2019) doi:10.3847/1538-4357/ab0e15 [arXiv:1902.01557 [astro-ph.HE]].

63. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Low-latency Gravitational-wave Alerts for Multimessenger Astronomy during the Second Advanced LIGO and Virgo Observing Run," Astrophys. J. **875**, no.2, 161 (2019) doi:10.3847/1538-4357/ab0e8f [arXiv:1901.03310 [astro-ph.HE]].

64. M. Soares-Santos *et al.* [DES, LIGO Scientific and Virgo], "First Measurement of the Hubble Constant from a Dark Standard Siren using the Dark Energy Survey Galaxies and the LIGO/Virgo Binary–Black-hole Merger GW170814," Astrophys. J. Lett. **876**, no.1, L7 (2019) doi:10.3847/2041-8213/ab14f1 [arXiv:1901.01540 [astro-ph.CO]].

65. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "Searches for Continuous Gravitational Waves from 15 Supernova Remnants and Fomalhaut b with Advanced LIGO," Astrophys. J. **875**, no.2, 122 (2019) [erratum: Astrophys. J. **918**, no.2, 91 (2021)] doi:10.3847/1538-4357/ab113b [arXiv:1812.11656 [astro-ph.HE]].

66. M. Cavaglia, K. Staats and T. Gill, "Finding the origin of noise transients in LIGO data with machine learning," Commun. Comput. Phys. **25**, no.4, 963-987 (2019) doi:10.4208/cicp.OA-2018-0092 [arXiv:1812.05225 [physics.data-an]].

67. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GWTC-1: A Gravitational-Wave Transient Catalog of Compact Binary Mergers Observed by LIGO and Virgo during the First and Second Observing Runs," Phys. Rev. X **9**, no.3, 031040 (2019) doi:10.1103/PhysRevX.9.031040 [arXiv:1811.12907 [astro-ph.HE]].

68. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Binary Black Hole Population Properties Inferred from the First and Second Observing Runs of Advanced LIGO and Advanced Virgo," Astrophys. J. Lett. **882**, no.2, L24 (2019) doi:10.3847/2041-8213/ab3800 [arXiv:1811.12940 [astro-ph.HE]].

69. K. Mogushi, M. Cavaglià and K. Siellez, "Jet Geometry and Rate Estimate of Coincident Gamma Ray Burst and Gravitational Wave Observations," Astrophys. J. **880**, 55 (2019) doi:10.3847/1538-4357/ab1f76 [arXiv:1811.08542 [astro-ph.HE]].

70. A. Albert *et al.* [ANTARES, IceCube, LIGO and Virgo], "Search for Multimessenger Sources of Gravitational Waves and High-energy Neutrinos with Advanced LIGO during Its First Observing Run, ANTARES, and IceCube," Astrophys. J. **870**, no.2, 134 (2019) doi:10.3847/1538-4357/aaf21d [arXiv:1810.10693 [astro-ph.HE]].

71. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Tests of General Relativity with GW170817," Phys. Rev. Lett. **123**, no.1, 011102 (2019) doi:10.1103/PhysRevLett.123. 011102 [arXiv:1811.00364 [gr-qc]].

72. E. Burns *et al.* [Fermi Gamma-ray Burst Monitor Team, LIGO Scientific and Virgo], "A Fermi Gamma-ray Burst Monitor Search for Electromagnetic Signals Coincident with Gravitational-Wave Candidates in Advanced LIGO's First Observing Run," Astrophys. J. **871**, no.1, 90 (2019) doi:10.3847/1538-4357/aaf726 [arXiv:1810.02764 [astro-ph.HE]].

73. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for gravitational waves from a long-lived remnant of the binary neutron star merger GW170817," Astrophys. J. **875**, no.2, 160 (2019) doi:10.3847/1538-4357/ab0f3d [arXiv:1810.02581 [gr-qc]].

74. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Constraining the p-Mode–g-Mode Tidal Instability with GW170817," Phys. Rev. Lett. **122**, no.6, 061104 (2019) doi:10.1103/PhysRevLett.122.061104 [arXiv:1808.08676 [astro-ph.HE]].

75. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Subsolar-Mass Ultracompact Binaries in Advanced LIGO's First Observing Run," Phys. Rev. Lett. **121**, no.23, 231103 (2018) doi:10.1103/PhysRevLett.121.231103 [arXiv:1808.04771 [astro-ph.CO]].

76. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW170817: Measurements of neutron star radii and equation of state," Phys. Rev. Lett. **121**, no.16, 161101 (2018) doi:10.1103/PhysRevLett.121.161101 [arXiv:1805.11581 [gr-qc]].

77. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Properties of the binary neutron star merger GW170817," Phys. Rev. X **9**, no.1, 011001 (2019) doi:10.1103/PhysRevX.9. 011001 [arXiv:1805.11579 [gr-qc]].

78. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Tensor, Vector, and Scalar Polarizations in the Stochastic Gravitational-Wave Background," Phys. Rev. Lett. **120**, no.20, 201102 (2018) doi:10.1103/PhysRevLett.120.201102 [arXiv:1802.10194 [gr-qc]].

79. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Full Band All-sky Search for Periodic Gravitational Waves in the O1 LIGO Data," Phys. Rev. D **97**, no.10, 102003 (2018) doi:10.1103/PhysRevD.97.102003 [arXiv:1802.05241 [gr-qc]].

80. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Constraints on cosmic strings using data from the first Advanced LIGO observing run," Phys. Rev. D **97**, no.10, 102002 (2018) doi:10.1103/PhysRevD.97.102002 [arXiv:1712.01168 [gr-qc]].

81. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky search for long-duration gravitational wave transients in the first Advanced LIGO observing run," Class. Quant. Grav. **35**, no.6, 065009 (2018) doi:10.1088/1361-6382/aaab76 [arXiv:1711.06843 [gr-qc]].

82. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW170608: Observation of a 19-solar-mass Binary Black Hole Coalescence," Astrophys. J. Lett. **851**, L35 (2017) doi:10.3847/2041-8213/aa9f0c [arXiv:1711.05578 [astro-ph.HE]].

83. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for Post-merger Gravitational Waves from the Remnant of the Binary Neutron Star Merger GW170817," Astrophys. J. Lett. **851**, no.1, L16 (2017) doi:10.3847/2041-8213/aa9a35 [arXiv:1710.09320 [astro-ph.HE]].

84. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral," Phys. Rev. Lett. **119**, no.16, 161101 (2017) doi:10.1103/PhysRevLett.119.161101 [arXiv:1710.05832 [gr-qc]].

85. B. P. Abbott *et al.* [LIGO Scientific, Virgo, Fermi GBM, INTEGRAL, IceCube, AstroSat Cadmium Zinc Telluride Imager Team, IPN, Insight-Hxmt, ANTARES, Swift, AGILE Team, 1M2H Team, Dark Energy Camera GW-EM, DES, DLT40, GRAWITA, Fermi-LAT, ATCA, ASKAP, Las Cumbres Observatory Group, OzGrav, DWF (Deeper Wider Faster Program), AST3, CAASTRO, VINROUGE, MASTER, J-GEM, GROWTH, JAGWAR, CaltechNRAO, TTU-NRAO, NuSTAR, Pan-STARRS, MAXI Team, TZAC Consortium, KU, Nordic Optical Telescope, ePESSTO, GROND, Texas Tech University, SALT Group, TOROS, BOOTES, MWA, CALET, IKI-GW Follow-up, H.E.S.S., LOFAR, LWA, HAWC, Pierre Auger, ALMA, Euro VLBI Team, Pi of Sky, Chandra Team at McGill University, DFN, ATLAS Telescopes, High Time Resolution Universe Survey, RIMAS, RATIR and SKA South Africa/MeerKAT], "Multi-messenger Observations of a Binary Neutron Star Merger," Astrophys. J. Lett. **848**, no.2, L12 (2017) doi:10.3847/2041-8213/aa91c9 [arXiv:1710.05833 [astro-ph.HE]].

86. B. P. Abbott *et al.* [LIGO Scientific, Virgo, Fermi-GBM and INTEGRAL], "Gravitational Waves and Gamma-rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A," Astrophys. J. Lett. **848**, no.2, L13 (2017) doi:10.3847/2041-8213/aa920c [arXiv:1710.05834 [astro-ph.HE]].

87. B. P. Abbott *et al.* [LIGO Scientific, Virgo, 1M2H, Dark Energy Camera GW-E, DES, DLT40, Las Cumbres Observatory, VINROUGE and MASTER], "A gravitational-wave standard siren measurement of the Hubble constant," Nature **551**, no.7678, 85-88 (2017) doi:10.1038/nature 24471 [arXiv:1710.05835 [astro-ph.CO]].

88. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Estimating the Contribution of Dynamical Ejecta in the Kilonova Associated with GW170817," Astrophys. J. Lett. **850**, no.2, L39 (2017) doi:10.3847/2041-8213/aa9478 [arXiv:1710.05836 [astro-ph.HE]].

89. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "On the Progenitor of Binary Neutron Star Merger GW170817," Astrophys. J. Lett. **850**, no.2, L40 (2017) doi:10.3847/2041-8213/aa93fc [arXiv:1710.05838 [astro-ph.HE]].

90. A. Albert *et al.* [ANTARES, IceCube, Pierre Auger, LIGO Scientific and Virgo], "Search for High-energy Neutrinos from Binary Neutron Star Merger GW170817 with ANTARES, IceCube, and the Pierre Auger Observatory," Astrophys. J. Lett. **850**, no.2, L35 (2017) doi:10.3847/2041-8213/aa9aed [arXiv:1710.05839 [astro-ph.HE]].

91. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences," Phys. Rev. Lett. **120**, no.9, 091101 (2018) doi:10.1103/PhysRevLett.120.091101 [arXiv: 1710.05837 [gr-qc]].

92. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "First narrow-band search for continuous gravitational waves from known pulsars in advanced detector data," Phys. Rev. D **96**, no.12, 122006 (2017) [erratum: Phys. Rev. D **97**, no.12, 129903 (2018)] doi:10.1103/PhysRevD.96.122006 [arXiv:1710.02327 [gr-qc]].

93. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Effects of data quality vetoes on a search for compact binary coalescences in Advanced LIGO's first observing run," Class. Quant. Grav. **35**, no.6, 065010 (2018) doi:10.1088/1361-6382/aaaafa [arXiv:1710.02185 [gr-qc]].

94. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence," Phys. Rev. Lett. **119**, no.14, 141101 (2017) doi:10.1103/PhysRevLett.119.141101 [arXiv:1709.09660 [gr-qc]].

95. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "First search for nontensorial gravitational waves from known pulsars," Phys. Rev. Lett. **120**, no.3, 031104 (2018) doi:10.1103/PhysRev Lett.120.031104 [arXiv:1709.09203 [gr-qc]].

96. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky Search for Periodic Gravitational Waves in the O1 LIGO Data," Phys. Rev. D **96**, no.6, 062002 (2017) doi:10.1103/PhysRevD.96. 062002 [arXiv:1707.02667 [gr-qc]].

97. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "First low-frequency Einstein@Home all-sky search for continuous gravitational waves in Advanced LIGO data," Phys. Rev. D **96**, no.12, 122004 (2017) doi:10.1103/PhysRevD.96.122004 [arXiv:1707.02669 [gr-qc]].

98. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Upper Limits on Gravitational Waves from Scorpius X-1 from a Model-Based Cross-Correlation Search in Advanced LIGO Data," Astrophys. J. **847**, no.1, 47 (2017) doi:10.3847/1538-4357/aa86f0 [arXiv: 1706.03119 [astro-ph.HE]].

99. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2," Phys. Rev. Lett. **118**, no.22, 221101 (2017) [erratum: Phys. Rev. Lett. **121**, no.12, 129901 (2018)] doi:10.1103/PhysRevLett.118.221101 [arXiv:1706.01812 [gr-qc]].

100. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO," Phys. Rev. D **96**, no.2, 022001 (2017) doi:10.1103/PhysRevD.96.022001 [arXiv:1704.04628 [gr-qc]].

101. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "Search for gravitational waves from Scorpius X-1 in the first Advanced LIGO observing run with a hidden Markov model," Phys. Rev. D **95**, no.12, 122003 (2017) doi:10.1103/PhysRevD.95.122003 [arXiv:1704.03719 [gr-qc]].

102. A. Albert *et al.* [ANTARES, IceCube, LIGO Scientific and Virgo], "Search for High-energy Neutrinos from Gravitational Wave Event GW151226 and Candidate LVT151012 with ANTARES and IceCube," Phys. Rev. D **96**, no.2, 022005 (2017) doi:10.1103/Phys RevD.96.022005 [arXiv:1703.06298 [astro-ph.HE]].

103. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "First search for gravitational waves from known pulsars with Advanced LIGO," Astrophys. J. **839**, no.1, 12 (2017) [erratum: Astrophys. J. **851**, no.1, 71 (2017)] doi:10.3847/1538-4357/aa677f [arXiv:1701. 07709 [astro-ph.HE]].

104. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Upper Limits on the Stochastic Gravitational-Wave Background from Advanced LIGO's First Observing Run," Phys. Rev. Lett. **118**, no.12, 121101 (2017) [erratum: Phys. Rev. Lett. **119**, no.2, 029901 (2017)] doi:10.1103/PhysRevLett. 118.121101 [arXiv:1612.02029 [gr-qc]].

105. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Directional Limits on Persistent Gravitational Waves from Advanced LIGO's First Observing Run," Phys. Rev. Lett. **118**, no.12, 121102 (2017) doi:10.1103/PhysRevLett.118.121102 [arXiv:1612.02030 [gr-qc]].

106. B. P. Abbott *et al.* [LIGO Scientific, Virgo and IPN], "Search for Gravitational Waves Associated with Gamma-Ray Bursts During the First Advanced LIGO Observing Run and Implications for the Origin of GRB 150906B," Astrophys. J. **841**, no.2, 89 (2017) doi:10.3847/1538-4357/aa6c47 [arXiv:1611.07947 [astro-ph.HE]].

107. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Effects of waveform model systematics on the interpretation of GW150914," Class. Quant. Grav. **34**, no.10, 104002 (2017) doi:10.1088/1361-6382/aa6854 [arXiv:1611.07531 [gr-qc]].

108. M. Cavaglia, B. Harms and S. Hou, "Bounds on large extra dimensions from the Generalized Uncertainty Principle," Int. J. Mod. Phys. A **32**, no.15, 1750082 (2017) doi:10.1142/S0217751X1 7500828 [arXiv:1611.06283 [hep-ph]].

109. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "All-sky search for short gravitational-wave bursts in the first Advanced LIGO run," Phys. Rev. D **95**, no.4, 042003 (2017) doi:10.1103/PhysRevD.95.042003 [arXiv:1611.02972 [gr-qc]].

110. J. Powell, A. Torres-Forné, R. Lynch, D. Trifirò, E. Cuoco, M. Cavaglià, I. S. Heng and J. A. Font, "Classification methods for noise transients in advanced gravitational-wave detectors II: performance tests on Advanced LIGO data," Class. Quant. Grav. **34**, no.3, 034002 (2017) doi:10.1088/1361-6382/34/3/034002 [arXiv:1609.06262 [astro-ph.IM]].

111. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "The basic physics of the binary black hole merger GW150914," Annalen Phys. **529**, no.1-2, 1600209 (2017) doi:10.1002/andp. 201600209 [arXiv:1608.01940 [gr-qc]].

112. B. P. Abbott *et al.* [LIGO Scientific], "Exploring the Sensitivity of Next Generation Gravitational Wave Detectors," Class. Quant. Grav. **34**, no.4, 044001 (2017) doi:10.1088/1361-6382/aa51f4 [arXiv:1607.08697 [astro-ph.IM]].

113. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Upper Limits on the Rates of Binary Neutron Star and Neutron Star–black Hole Mergers From Advanced Ligo's First Observing run," Astrophys. J. Lett. **832**, no.2, L21 (2016) doi:10.3847/2041-8205/832/2/L21 [arXiv:1607.07456 [astro-ph.HE]].

114. T. D. Abbott *et al.* [LIGO Scientific and VIRGO], "Search for continuous gravitational waves from neutron stars in globular cluster NGC 6544," Phys. Rev. D **95**, no.8, 082005 (2017) doi:10.1103/PhysRevD.95.082005 [arXiv:1607.02216 [gr-qc]].

115. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Results of the deepest all-sky survey for continuous gravitational waves on LIGO S6 data running on the Einstein@Home volunteer distributed computing project," Phys. Rev. D **94**, no.10, 102002 (2016) doi:10.1103/PhysRevD.94.102002 [arXiv:1606.09619 [gr-qc]].

116. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence," Phys. Rev. Lett. **116**, no.24, 241103 (2016) doi:10.1103/PhysRevLett.116.241103 [arXiv:1606.04855 [gr-qc]].

117. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Binary Black Hole Mergers in the first Advanced LIGO Observing Run," Phys. Rev. X **6**, no.4, 041015 (2016) [erratum: Phys. Rev. X **8**, no.3, 039903 (2018)] doi:10.1103/PhysRevX.6.041015 [arXiv:1606.04856 [gr-qc]].

118. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Supplement: The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914," Astrophys. J. Suppl. **227**, no.2, 14 (2016) doi:10.3847/0067-0049/227/2/14 [arXiv:1606.03939 [astro-ph.HE]].

119. T. D. Abbott *et al.* [LIGO Scientific and Virgo], "Improved analysis of GW150914 using a fully spin-precessing waveform Model," Phys. Rev. X **6**, no.4, 041014 (2016) doi:10.1103/PhysRevX. 6.041014 [arXiv:1606.01210 [gr-qc]].

120. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence," Phys. Rev. D **94**, no.6, 064035 (2016) doi:10.1103/PhysRevD.94.064035 [arXiv:1606.01262 [gr-qc]].

121. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Comprehensive all-sky search for periodic gravitational waves in the sixth science run LIGO data," Phys. Rev. D **94**, no.4, 042002 (2016) doi:10.1103/PhysRevD.94.042002 [arXiv:1605.03233 [gr-qc]].

122. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Search for transient gravitational waves in coincidence with short-duration radio transients during 2007–2013," Phys. Rev. D **93**, no.12, 122008 (2016) doi:10.1103/PhysRevD.93.122008 [arXiv:1605.01707 [astro-ph.HE]].

123. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "A First Targeted Search for Gravitational-Wave Bursts from Core-Collapse Supernovae in Data of First-Generation Laser Interferometer Detectors," Phys. Rev. D **94**, no.10, 102001 (2016) doi:10.1103/Phys RevD.94.102001 [arXiv:1605.01785 [gr-qc]].

124. B. P. Abbott *et al.* [LIGO Scientific, Virgo, ASKAP, BOOTES, DES, Fermi-GBM, Fermi-LAT, GRAWITA, INTEGRAL, iPTF, InterPlanetary Network, J-GEM, La Silla-QUEST Survey, Liverpool Telescope, LOFAR, MASTER, MAXI, MWA, Pan-STARRS, PESSTO, Pi of the Sky, SkyMapper, Swift, TAROT, Zadko, Algerian National Observatory, C2PU, TOROS and VISTA], "Supplement: Localization and broadband follow-up of the gravitational-wave transient GW150914," Astrophys. J. Suppl. **225**, no.1, 8 (2016) doi:10.3847/0067-0049/225/1/8 [arXiv:1604.07864 [astro-ph.HE]].

125. B. P. Abbott *et al.* [LIGO Scientific, Virgo, ASKAP, BOOTES, DES, Fermi GBM, Fermi-LAT, GRAWITA, INTEGRAL, iPTF, InterPlanetary Network, J-GEM, La Silla-QUEST Survey, Liverpool Telescope, LOFAR, MASTER, MAXI, MWA, Pan-STARRS, PESSTO, Pi of the Sky, SkyMapper, Swift, C2PU, TOROS and VISTA], "Localization and broadband follow-up of the gravitational-wave transient GW150914," Astrophys. J. Lett. **826**, no.1, L13 (2016) doi:10.3847/2041-8205/826/1/L13 [arXiv:1602.08492 [astro-ph.HE]].

126. S. Adrian-Martinez *et al.* [ANTARES, IceCube, LIGO Scientific and Virgo], "High-energy Neutrino follow-up search of Gravitational Wave Event GW150914 with ANTARES and IceCube," Phys. Rev. D **93**, no.12, 122010 (2016) doi:10.1103/PhysRevD.93. 122010 [arXiv:1602.05411 [astro-ph.HE]].

127. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Observation of Gravitational Waves from a Binary Black Hole Merger," Phys. Rev. Lett. **116**, no.6, 061102 (2016) doi:10.1103/PhysRevLett. 116.061102 [arXiv:1602.03837 [gr-qc]].

128. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW150914: The Advanced LIGO Detectors in the Era of First Discoveries," Phys. Rev. Lett. **116**, no.13, 131103 (2016) doi:10.1103/PhysRev Lett.116.131103 [arXiv:1602.03838 [gr-qc]].

129. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW150914: First results from the search for binary black hole coalescence with Advanced LIGO," Phys. Rev. D **93**, no.12, 122003 (2016) doi:10.1103/ PhysRevD.93.122003 [arXiv:1602.03839 [gr-qc]].

130. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Properties of the Binary Black Hole Merger GW150914," Phys. Rev. Lett. **116**, no.24, 241102 (2016) doi:10.1103/PhysRev Lett.116.241102 [arXiv:1602.03840 [gr-qc]].

131. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914," Astrophys. J. Lett. **833**, no.1, L1 (2016) doi:10.3847/2041-8205/833/1/L1 [arXiv:1602.03842 [astro-ph.HE]].

132. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Observing gravitational-wave transient GW150914 with minimal assumptions," Phys. Rev. D **93**, no.12, 122004 (2016) doi:10.1103/ PhysRevD.93.122004 [arXiv:1602.03843 [gr-qc]].

133. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914," Class. Quant. Grav. **33**, no.13, 134001 (2016) doi:10.1088/0264-9381/33/13/134001 [arXiv:1602.03844 [gr-qc]].

134. B. P. Abbott *et al.* [LIGO Scientific], "Calibration of the Advanced LIGO detectors for the discovery of the binary black-hole merger GW150914," Phys. Rev. D **95**, no.6, 062003 (2017) doi:10.1103/PhysRevD.95.062003 [arXiv:1602.03845 [gr-qc]].

135. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Astrophysical Implications of the Binary Black-Hole Merger GW150914," Astrophys. J. Lett. **818**, no.2, L22 (2016) doi:10.3847/2041-8205/818/2/L22 [arXiv:1602.03846 [astro-ph.HE]].

136. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "GW150914: Implications for the stochastic gravitational wave background from binary black holes," Phys. Rev. Lett. **116**, no.13, 131102 (2016) doi:10.1103/PhysRevLett.116.131102 [arXiv:1602.03847 [gr-qc]].

137. B. P. Abbott *et al.* [LIGO Scientific and Virgo], "Tests of general relativity with GW150914," Phys. Rev. Lett. **116**, no.22, 221101 (2016) [erratum: Phys. Rev. Lett. **121**, no.12, 129902 (2018)] doi:10.1103/PhysRevLett.116.221101 [arXiv:1602.03841 [gr-qc]].

138. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "All-sky search for long-duration gravitational wave transients with initial LIGO," Phys. Rev. D **93**, no.4, 042005 (2016) doi:10.1103/PhysRevD.93.042005 [arXiv:1511.04398 [gr-qc]].

139. J. Aasi *et al.* [LIGO Scientific and VIRGO], "First low frequency all-sky search for continuous gravitational wave signals," Phys. Rev. D **93**, no.4, 042007 (2016) doi:10.1103/PhysRevD.93.042007 [arXiv:1510.03621 [astro-ph.IM]].

140. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Search of the Orion spur for continuous gravitational waves using a loosely coherent algorithm on data from LIGO interferometers," Phys. Rev. D **93**, no.4, 042006 (2016) doi:10.1103/PhysRevD.93.042006 [arXiv:1510.03474 [gr-qc]].

141. S. Hou, B. Harms and M. Cavaglia, "Bounds on large extra dimensions from the simulation of black hole events at the LHC," JHEP **11**, 185 (2015) doi:10.1007/JHEP11(2015)185 [arXiv:1507.01632 [hep-ph]].

142. J. Powell, D. Trifirò, E. Cuoco, I. S. Heng and M. Cavaglià, "Classification methods for noise transients in advanced gravitational-wave detectors," Class. Quant. Grav. **32**, no.21, 215012 (2015) doi:10.1088/0264-9381/32/21/215012 [arXiv:1505.01299 [astro-ph.IM]].

143. J. Aasi *et al.* [LIGO Scientific], "Searches for continuous gravitational waves from nine young supernova remnants," Astrophys. J. **813**, no.1, 39 (2015) [erratum: Astrophys. J. **918**, no.2, 90 (2021)] doi:10.3847/1538-4357/ac1f2d [arXiv:1412.5942 [astro-ph.HE]].

144. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Directed search for gravitational waves from Scorpius X-1 with initial LIGO data," Phys. Rev. D **91**, no.6, 062008 (2015) doi:10.1103/PhysRevD.91.062008 [arXiv:1412.0605 [gr-qc]].

145. J. Aasi *et al.* [LIGO Scientific], "Advanced LIGO," Class. Quant. Grav. **32**, 074001 (2015) doi:10.1088/0264-9381/32/7/074001 [arXiv:1411.4547 [gr-qc]].

146. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Narrow-band search of continuous gravitational-wave signals from Crab and Vela pulsars in Virgo VSR4 data," Phys. Rev. D **91**, no.2, 022004 (2015) doi:10.1103/PhysRevD.91.022004 [arXiv:1410.8310 [astro-ph.IM]].

147. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Characterization of the LIGO detectors during their sixth science run," Class. Quant. Grav. **32**, no.11, 115012 (2015) doi:10.1088/0264-9381/32/11/115012 [arXiv:1410.7764 [gr-qc]].

148. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Searching for stochastic gravitational waves using data from the two colocated LIGO Hanford detectors," Phys. Rev. D **91**, no.2, 022003 (2015) doi:10.1103/PhysRevD.91.022003 [arXiv:1410.6211 [gr-qc]].

149. M. G. Aartsen *et al.* [IceCube, LIGO Scientific and VIRGO], "Multimessenger search for sources of gravitational waves and high-energy neutrinos: Initial results for LIGO-Virgo and IceCube," Phys. Rev. D **90**, no.10, 102002 (2014) doi:10.1103/PhysRevD.90 .102002 [arXiv:1407.1042 [astro-ph.HE]].

150. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Improved Upper Limits on the Stochastic Gravitational-Wave Background from 2009–2010 LIGO and Virgo Data," Phys. Rev. Lett. **113**, no.23, 231101 (2014) doi:10.1103/PhysRevLett.113.231101 [arXiv:1406.4556 [gr-qc]].

151. J. Aasi *et al.* [LIGO Scientific and VIRGO], "First all-sky search for continuous gravitational waves from unknown sources in binary systems," Phys. Rev. D **90**, no.6, 062010 (2014) doi:10.1103/PhysRevD.90.062010 [arXiv:1405.7904 [gr-qc]].

152. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Methods and results of a search for gravitational waves associated with gamma-ray bursts using the GEO600, LIGO, and Virgo detectors," Phys. Rev. D **89**, no.12, 122004 (2014) doi:10.1103/PhysRevD.89.122004 [arXiv:1405.1053 [astro-ph.HE]].

153. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Search for gravitational radiation from intermediate mass black hole binaries in data from the second LIGO-Virgo joint science run," Phys. Rev. D **89**, no.12, 122003 (2014) doi:10.1103/PhysRevD.89.122003 [arXiv:1404.2199 [gr-qc]].

154. J. Aasi *et al.* [LIGO Scientific, VIRGO and IPN], "Search for gravitational waves associated with γ-ray bursts detected by the Interplanetary Network," Phys. Rev. Lett. **113**, no.1, 011102 (2014) doi:10.1103/PhysRevLett.113.011102 [arXiv:1403.6639 [astro-ph.HE]].

155. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Search for gravitational wave ringdowns from perturbed intermediate mass black holes in LIGO-Virgo data from 2005–2010," Phys. Rev. D **89**, no.10, 102006 (2014) doi:10.1103/PhysRevD.89.102006 [arXiv:1403. 5306 [gr-qc]].

156. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Implementation of an $\mathcal{F}$-statistic all-sky search for continuous gravitational waves in Virgo VSR1 data," Class. Quant. Grav. **31**, 165014 (2014) doi:10.1088/0264-9381/31/16/165014 [arXiv:1402.4974 [gr-qc]].

157. J. Aasi *et al.* [LIGO Scientific, VIRGO and NINJA-2], "The NINJA-2 project: Detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations," Class. Quant. Grav. **31**, 115004 (2014) doi:10.1088/0264-9381/31/11/115004 [arXiv:1401.0939 [gr-qc]].

158. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Application of a Hough search for continuous gravitational waves on data from the fifth LIGO science run," Class. Quant. Grav. **31**, 085014 (2014) doi:10.1088/0264-9381/31/8/085014 [arXiv:1311.2409 [gr-qc]].

159. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Constraints on cosmic strings from the LIGO-Virgo gravitational-wave detectors," Phys. Rev. Lett. **112**, 131101 (2014) doi:10.1103/PhysRevLett.112.131101 [arXiv:1310.2384 [gr-qc]].

160. J. Aasi *et al.* [LIGO Scientific and VIRGO], "First Searches for Optical Counterparts to Gravitational-wave Candidate Events," Astrophys. J. Suppl. **211**, 7 (2014) doi:10.1088/0067-0049/211/1/7 [arXiv:1310.2314 [astro-ph.IM]].

161. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Directed search for continuous gravitational waves from the Galactic center," Phys. Rev. D **88**, no.10, 102002 (2013) doi:10.1103/PhysRevD.88.102002 [arXiv:1309.6221 [gr-qc]].

162. J. Aasi *et al.* [LIGO Scientific], "Gravitational waves from known pulsars: results from the initial detector era," Astrophys. J. **785**, 119 (2014) doi:10.1088/0004-637X/785/2/119 [arXiv:1309.4027 [astro-ph.HE]].

163. J. Aasi *et al.* [LIGO Scientific], "Enhancing the sensitivity of the LIGO gravitational wave detector by using squeezed states of light," Nature Photon. **7**, 613-619 (2013) doi:10.1038/nphoton.2013.177 [arXiv:1310.0383 [quant-ph]].

164. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Parameter estimation for compact binary coalescence signals with the first generation gravitational-wave detector network," Phys. Rev. D **88**, 062001 (2013) doi:10.1103/PhysRevD.88.062001 [arXiv:1304.1775 [gr-qc]].

165. B. P. Abbott *et al.* [KAGRA, LIGO Scientific, Virgo and VIRGO], "Prospects for observing and localizing gravitational-wave transients with Advanced LIGO, Advanced Virgo and KAGRA," Living Rev. Rel. **23** no.1, 3, (2020); Living Rev. Rel. **21**, no.1, 3 (2018) doi:10.1007/s41114-020-00026-9 [arXiv:1304.0670 [gr-qc]].

166. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Search for gravitational waves from binary black hole inspiral, merger, and ringdown in LIGO-Virgo data from 2009–2010," Phys. Rev. D **87**, no.2, 022002 (2013) doi:10.1103/PhysRevD.87.022002 [arXiv:1209.6533 [gr-qc]].

167. J. Aasi *et al.* [LIGO Scientific and VIRGO], "Einstein@Home all-sky search for periodic gravitational waves in LIGO S5 data," Phys. Rev. D **87**, no.4, 042001 (2013) doi:10.1103/PhysRevD.87.042001 [arXiv:1207.7176 [gr-qc]].

168. P. A. Evans *et al.* [LIGO Scientific], "Swift follow-up observations of candidate gravitational-wave transient events," Astrophys. J. Suppl. **203**, 28 (2012) doi:10.1088/0067-0049/203/2/28 [arXiv:1205.1124 [astro-ph.HE]].

169. J. Abadie *et al.* [LIGO Scientific], "Search for gravitational waves associated with gamma-ray bursts during LIGO science run 6 and Virgo science runs 2 and 3," Astrophys. J. **760**, 12 (2012) doi:10.1088/0004-637X/760/1/12 [arXiv:1205.2216 [astro-ph.HE]].

170. S. Adrian-Martinez *et al.* [LIGO Scientific and VIRGO], "A First Search for coincident Gravitational Waves and High Energy Neutrinos using LIGO, Virgo and ANTARES data from 2007," JCAP **06**, 008 (2013) doi:10.1088/1475-7516/2013/06/008 [arXiv: 1205.3018 [astro-ph.HE]].

171. J. Aasi *et al.* [VIRGO], "The characterization of Virgo data and its impact on gravitational-wave searches," Class. Quant. Grav. **29**, 155002 (2012) doi:10.1088/0264-9381/29/15/155002 [arXiv:1203.5613 [gr-qc]].

172. C. E. Petrillo, A. Dietz and M. Cavaglia, "Compact object coalescence rate estimation from short gamma-ray burst observations," Astrophys. J. **767**, 140 (2013) doi:10.1088/0004-637X/767/2/140 [arXiv:1202.0804 [astro-ph.CO]].

173. J. Abadie *et al.* [LIGO Scientific and VIRGO], "All-sky search for gravitational-wave bursts in the second joint LIGO-Virgo run," Phys. Rev. D **85**, 122007 (2012) doi:10.1103/PhysRevD.85.122007 [arXiv:1202.2788 [gr-qc]].

174. J. Abadie *et al.* [LIGO Scientific], "Implications For The Origin Of GRB 051103 From LIGO Observations," Astrophys. J. **755**, 2 (2012) doi:10.1088/0004-637X/755/1/2 [arXiv:1201.4413 [astro-ph.HE]].

175. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Search for Gravitational Waves from Intermediate Mass Binary Black Holes," Phys. Rev. D **85**, 102004 (2012) doi:10.1103/PhysRevD.85.102004 [arXiv:1201.5999 [gr-qc]].

176. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Upper limits on a stochastic gravitational-wave background using LIGO and Virgo interferometers at 600-1000 Hz," Phys. Rev. D **85**, 122001 (2012) doi:10.1103/PhysRevD.85.122001 [arXiv:1112.5004 [gr-qc]].

177. J. Abadie *et al.* [VIRGO and LIGO Scientific], "First Low-Latency LIGO+Virgo Search for Binary Inspirals and their Electromagnetic Counterparts," Astron. Astrophys. **541**, A155 (2012) doi:10.1051/0004-6361/201218860 [arXiv:1112.6005 [astro-ph.CO]].

178. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Search for Gravitational Waves from Low Mass Compact Binary Coalescence in LIGO's Sixth Science Run and Virgo's Science Runs 2 and 3," Phys. Rev. D **85**, 082002 (2012) doi:10.1103/PhysRevD.85.082002 [arXiv:1111.7314 [gr-qc]].

179. J. Abadie *et al.* [LIGO Scientific and VIRGO], "All-sky Search for Periodic Gravitational Waves in the Full S5 LIGO Data," Phys. Rev. D **85**, 022001 (2012) doi:10.1103/ PhysRevD.85.022001 [arXiv:1110.0208 [gr-qc]].

180. J. Abadie *et al.* [LIGO Scientific], "Directional limits on persistent gravitational waves using LIGO S5 science data," Phys. Rev. Lett. **107**, 271102 (2011) doi:10.1103/Phys RevLett.107.271102 [arXiv:1109.1809 [astro-ph.CO]].

181. J. Abadie *et al.* [LIGO Scientific], "A Gravitational wave observatory operating beyond the quantum shot-noise limit: Squeezed light in application," Nature Phys. **7**, 962-965 (2011) doi:10.1038/nphys2083 [arXiv:1109.2295 [quant-ph]].

182. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "Implementation and testing of the first prompt search for gravitational wave transients with electromagnetic counterparts," Astron. Astrophys. **539**, A124 (2012) doi:10.1051/0004-6361/201118219 [arXiv:1109.3498 [astro-ph.IM]].

183. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Beating the spin-down limit on gravitational wave emission from the Vela pulsar," Astrophys. J. **737**, 93 (2011) doi:10.1088/0004-637X/737/2/93 [arXiv:1104.2712 [astro-ph.HE]].

184. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Search for gravitational waves from binary black hole inspiral, merger and ringdown," Phys. Rev. D **83**, 122005 (2011) [erratum: Phys. Rev. D **86**, 069903 (2012)] doi:10.1103/PhysRevD.83.122005 [arXiv: 1102.3781 [gr-qc]].

185. J. Abadie *et al.* [LIGO Scientific], "A search for gravitational waves associated with the August 2006 timing glitch of the Vela pulsar," Phys. Rev. D **83**, 042001 (2011) doi:10.1103/PhysRevD.83.042001 [arXiv:1011.1357 [gr-qc]].

186. J. Abadie *et al.* [LIGO Scientific and Virgo], "Search for Gravitational Wave Bursts from Six Magnetars," Astrophys. J. Lett. **734**, L35 (2011) doi:10.1088/2041-8205/734/2/L35 [arXiv:1011.4079 [astro-ph.HE]].

187. J. Abadie *et al.* [LIGO Scientific], "Calibration of the LIGO Gravitational Wave Detectors in the Fifth Science Run," Nucl. Instrum. Meth. A **624**, 223-240 (2010) doi:10.1016/j.nima.2010.07.089 [arXiv:1007.3973 [gr-qc]].

188. J. Abadie *et al.* [LIGO Scientific], "First search for gravitational waves from the youngest known neutron star," Astrophys. J. **722**, 1504-1513 (2010) doi:10.1088/0004-637X/722/2/1504 [arXiv:1006.2535 [gr-qc]].

189. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Search for Gravitational Waves from Compact Binary Coalescence in LIGO and Virgo Data from S5 and VSR1," Phys. Rev. D **82**, 102001 (2010) doi:10.1103/PhysRevD.82.102001 [arXiv:1005.4655 [gr-qc]].

190. J. Slutsky, L. Blackburn, D. A. Brown, L. Cadonati, J. Cain, M. Cavaglia, S. Chatterji, N. Christensen, M. Coughlin and S. Desai, *et al.* "Methods for Reducing False Alarms in Searches for Compact Binary Coalescences in LIGO Data," Class. Quant. Grav. **27**, 165023 (2010) doi:10.1088/0264-9381/27/16/165023 [arXiv:1004.0998 [gr-qc]].

191. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Predictions for the Rates of Compact Binary Coalescences Observable by Ground-based Gravitational-wave Detectors," Class. Quant. Grav. **27**, 173001 (2010) doi:10.1088/0264-9381/27/17/173001 [arXiv: 1003.2480 [astro-ph.HE]].

192. J. Abadie *et al.* [LIGO Scientific and VIRGO], "All-sky search for gravitational-wave bursts in the first joint LIGO-GEO-Virgo run," Phys. Rev. D **81**, 102001 (2010) doi:10.1103/PhysRevD.81.102001 [arXiv:1002.1036 [gr-qc]].

193. J. Abadie *et al.* [LIGO Scientific and VIRGO], "Search for gravitational-wave inspiral signals associated with short Gamma-Ray Bursts during LIGO's fifth and Virgo's first science run," Astrophys. J. **715**, 1453-1461 (2010) doi:10.1088/0004-637X/715/2/1453 [arXiv:1001.0165 [astro-ph.HE]].

194. B. P. Abbott *et al.* [LIGO Scientific and VIRGO], "An Upper Limit on the Stochastic Gravitational-Wave Background of Cosmological Origin," Nature **460**, 990 (2009) doi:10.1038/nature08278 [arXiv:0910.5772 [astro-ph.CO]].

195. B. P. Abbott *et al.* [VIRGO], "Searches for gravitational waves from known pulsars with S5 LIGO data," Astrophys. J. **713**, 671-685 (2010) doi:10.1088/0004-637X/713/1/671 [arXiv:0909.3583 [astro-ph.HE]].

196. B. P. Abbott *et al.* [VIRGO], "Search for gravitational-wave bursts associated with gamma-ray bursts using data from LIGO Science Run 5 and Virgo Science Run 1," Astrophys. J. **715**, 1438-1452 (2010) doi:10.1088/0004-637X/715/2/1438 [arXiv:0908.3824 [astro-ph.HE]].

197. B. P. Abbott *et al.* [LIGO Scientific], "Stacked Search for Gravitational Waves from the 2006 SGR 1900+14 Storm," Astrophys. J. Lett. **701**, L68-L74 (2009) doi:10.1088/0004-637X/701/2/L68 [arXiv:0905.0005 [astro-ph.HE]].

198. B. P. Abbott *et al.* [LIGO Scientific], "Search for gravitational-wave bursts in the first year of the fifth LIGO science run," Phys. Rev. D **80**, 102001 (2009) doi:10.1103/Phys RevD.80.102001 [arXiv:0905.0020 [gr-qc]].

199. B. P. Abbott *et al.* [LIGO Scientific], "Search for gravitational wave ringdowns from perturbed black holes in LIGO S4 data," Phys. Rev. D **80**, 062001 (2009) doi:10.1103/ PhysRevD.80.062001 [arXiv:0905.1654 [gr-qc]].

200. B. P. Abbott *et al.* [LIGO Scientific], "Einstein and Home search for periodic gravitational waves in early S5 LIGO data," Phys. Rev. D **80**, 042003 (2009) doi:10.1103/Phys RevD.80.042003 [arXiv:0905.1705 [gr-qc]].

201. B. P. Abbott *et al.* [LIGO Scientific], "Search for Gravitational Waves from Low Mass Compact Binary Coalescence in 186 Days of LIGO's fifth Science Run," Phys. Rev. D **80**, 047101 (2009) doi:10.1103/PhysRevD.80.047101 [arXiv:0905.3710 [gr-qc]].

202. B. P. Abbott *et al.* [LIGO Scientific], "First LIGO search for gravitational wave bursts from cosmic (super)strings," Phys. Rev. D **80**, 062002 (2009) doi:10.1103/PhysRevD. 80.062002 [arXiv:0904.4718 [astro-ph.CO]].

203. B. P. Abbott *et al.* [LIGO Scientific], "Search for High Frequency Gravitational Wave Bursts in the First Calendar Year of LIGO's Fifth Science Run," Phys. Rev. D **80**, 102002 (2009) doi:10.1103/PhysRevD.80.102002 [arXiv:0904.4910 [gr-qc]].

204. A. Roy and M. Cavaglia, "String resonances at the Large Hadron Collider," Phys. Rev. D **80**, 015006 (2009) doi:10.1103/PhysRevD.80.015006 [arXiv:0902.1473 [hep-ph]].

205. B. P. Abbott *et al.* [LIGO Scientific], "Search for Gravitational Waves from Low Mass Binary Coalescences in the First Year of LIGO's S5 Data," Phys. Rev. D **79**, 122001 (2009) doi:10.1103/PhysRevD.79.122001 [arXiv:0901.0302 [gr-qc]].

206. V. Cardoso, P. Pani, M. Cadoni and M. Cavaglia, "Instability of hyper-compact Kerr-like objects," Class. Quant. Grav. **25**, 195010 (2008) doi:10.1088/0264-9381/25/19/ 195010 [arXiv:0808.1615 [gr-qc]].

207. M. Cavaglia and B. Harms, "PP-waves on Superbrane Backgrounds," Mod. Phys. Lett. A **23**, 3225-3231 (2008) doi:10.1142/S0217732308028600 [arXiv:0802.4090 [hep-th]].

208. A. Roy and M. Cavaglia, "Discriminating Supersymmetry and Black Holes at the Large Hadron Collider," Phys. Rev. D **77**, 064029 (2008) doi:10.1103/PhysRevD.77.064029 [arXiv:0801.3281 [hep-ph]].

209. B. P. Abbott *et al.* [LIGO Scientific], "LIGO: The Laser interferometer gravitational-wave observatory," Rept. Prog. Phys. **72**, 076901 (2009) doi:10.1088/0034-4885/72/7/ 076901 [arXiv:0711.3041 [gr-qc]].

210. A. Roy and M. Cavaglia, "Supersymmetry versus black holes at the LHC," Mod. Phys. Lett. A **23**, 2987-2996 (2008) doi:10.1142/S0217732308028399 [arXiv:0710.5490 [hep-ph]].

211. V. Cardoso, P. Pani, M. Cadoni and M. Cavaglia, "Ergoregion instability of ultracompact astrophysical objects," Phys. Rev. D **77**, 124044 (2008) doi:10.1103/PhysRevD.77 .124044 [arXiv:0709.0532 [gr-qc]].

212. M. Cavaglia and A. Roy, "QCD and spin effects in black hole airshowers," Phys. Rev. D **76**, 044005 (2007) doi:10.1103/PhysRevD.76.044005 [arXiv:0707.0274 [hep-ph]].

213. M. Cavaglia, R. Godang, L. M. Cremaldi and D. J. Summers, "Signatures of black holes at the LHC," JHEP **06**, 055 (2007) doi:10.1088/1126-6708/2007/06/055 [arXiv:0707.0317 [hep-ph]].

214. E. Berti, J. Cardoso, V. Cardoso and M. Cavaglia, "Matched-filtering and parameter estimation of ringdown waveforms," Phys. Rev. D **76**, 104044 (2007) doi:10.1103/PhysRev D.76.104044 [arXiv:0707.1202 [gr-qc]].

215. V. Cardoso, M. Cavaglia and J. Q. Guo, "Gravitational Larmor formula in higher dimensions," Phys. Rev. D **75**, 084020 (2007) doi:10.1103/PhysRevD.75.084020 [arXiv: hep-th/0702138 [hep-th]].

216. M. Cavaglia, R. Godang, L. Cremaldi and D. Summers, "Catfish: A Monte Carlo simulator for black holes at the LHC," Comput. Phys. Commun. **177**, 506-517 (2007) doi:10.1016/j.cpc.2007. 05.011 [arXiv:hep-ph/0609001 [hep-ph]].

217. V. Cardoso, M. Cavaglia and M. Pimenta, "Gravitational diffraction radiation," Phys. Rev. D **74**, 084011 (2006) doi:10.1103/PhysRevD.74.084011 [arXiv:hep-th/0609094 [hep-th]].

218. V. Cardoso and M. Cavaglia, "Stability of naked singularities and algebraically special modes," Phys. Rev. D **74**, 024027 (2006) doi:10.1103/PhysRevD.74.024027 [arXiv:gr-qc/0604101 [gr-qc]].

219. V. Cardoso, M. Cavaglia and L. Gualtieri, "Hawking emission of gravitons in higher dimensions: Non-rotating black holes," JHEP **02**, 021 (2006) doi:10.1088/1126-6708/2006 /02/021 [arXiv:hep-th/0512116 [hep-th]].

220. E. J. Ahn and M. Cavaglia, "Simulations of black hole air showers in cosmic ray detectors," Phys. Rev. D **73**, 042002 (2006) doi:10.1103/PhysRevD.73.042002 [arXiv:hep-ph/0511159 [hep-ph]].

221. V. Cardoso, M. Cavaglia and L. Gualtieri, "Black Hole Particle Emission in Higher-Dimensional Spacetimes," Phys. Rev. Lett. **96**, 071301 (2006) [erratum: Phys. Rev. Lett. **96**, 219902 (2006)] doi:10.1103/PhysRevLett.96.071301 [arXiv:hep-th/0512002 [hep-th]].

222. V. Cardoso, E. Berti and M. Cavaglia, "What we (don't) know about black hole formation in high-energy collisions," Class. Quant. Grav. **22**, L61-R84 (2005) doi:10.1088 /0264-9381/22/12/L01 [arXiv:hep-ph/0505125 [hep-ph]].

223. M. Cavaglia, G. De Risi and M. Gasperini, "Relic gravitons on Kasner-like branes," Phys. Lett. B **610**, 9-17 (2005) doi:10.1016/j.physletb.2005.01.089 [arXiv:hep-th/0501 251 [hep-th]].

224. B. Bolen and M. Cavaglia, "(Anti-)de Sitter black hole thermodynamics and the generalized uncertainty principle," Gen. Rel. Grav. **37**, 1255-1262 (2005) doi:10.1007/s10714-005-0108-x [arXiv:gr-qc/0411086 [gr-qc]].

225. R. Godang, S. B. Bracker, M. Cavaglia, L. Cremaldi, D. Summers and D. Cline, "Resolution of nearly mass degenerate Higgs bosons and production of black hole systems of known mass at a muon collider," Int. J. Mod. Phys. A **20**, 3409-3412 (2005) doi:10.1142/S0217751X05026674 [arXiv:hep-ph/0411248 [hep-ph]].

226. M. Cavaglia and S. Das, "How classical are TeV scale black holes?," Class. Quant. Grav. **21**, 4511-4522 (2004) doi:10.1088/0264-9381/21/19/001 [arXiv:hep-th/0404050 [hep-th]].

227. M. Cavaglia, G. Clement and A. Fabbri, "Approximately selfsimilar critical collapse in (2+1)-dimensions," Phys. Rev. D **70**, 044010 (2004) doi:10.1103/PhysRevD.70.044010 [arXiv:gr-qc/0404033 [gr-qc]].

228. E. J. Ahn, M. Cavaglia and A. V. Olinto, "Uncertainties in limits on TeV gravity from neutrino induced air showers," Astropart. Phys. **22**, 377-385 (2005) doi:10.1016/j.astro part-phys.2004.06.008 [arXiv:hep-ph/0312249 [hep-ph]].

229. E. Berti, M. Cavaglia and L. Gualtieri, "Gravitational energy loss in high-energy particle collisions: Ultrarelativistic plunge into a multidimensional black hole," Phys. Rev. D **69**, 124011 (2004) doi:10.1103/PhysRevD.69.124011 [arXiv:hep-th/0309203 [hep-th]].

230. E. J. Ahn, M. Ave, M. Cavaglia and A. V. Olinto, "TeV black hole fragmentation and detectability in extensive air showers," Phys. Rev. D **68**, 043004 (2003) doi:10.1103/ PhysRevD.68.043004 [arXiv:hep-ph/0306008 [hep-ph]].

231. E. J. Ahn and M. Cavaglia, "Cosmic black holes," Int. J. Mod. Phys. D **12**, 1699-1704 (2003) doi:10.1142/S0218271803004006 [arXiv:hep-ph/0306189 [hep-ph]].

232. M. Cavaglia, S. Das and R. Maartens, "Will we observe black holes at LHC?," Class. Quant. Grav. **20**, L205-L212 (2003) doi:10.1088/0264-9381/20/15/101 [arXiv:hep-ph/0305223 [hep-ph]].

233. M. Cavaglia, "Black hole multiplicity at particle colliders: Do black holes radiate mainly on the brane?," Phys. Lett. B **569**, 7-13 (2003) doi:10.1016/j.physletb.2003.06. 065 [arXiv:hep-ph/0305256 [hep-ph]].

234. M. Cavaglia, "Black hole and brane production in TeV gravity: A Review," Int. J. Mod. Phys. A **18**, 1843-1882 (2003) doi:10.1142/S0217751X03013569 [arXiv:hep-ph/0210296 [hep-ph]].

235. E. J. Ahn and M. Cavaglia, "A New era in high-energy physics," Gen. Rel. Grav. **34**, 2037-2042 (2002) doi:10.1023/A:1021123131985 [arXiv:hep-ph/0205168 [hep-ph]].

236. M. Cadoni, P. Carta, M. Cavaglia and S. Mignemi, "Two-dimensional dS / CFT correspondence," Phys. Rev. D **66**, 065008 (2002) doi:10.1103/PhysRevD.66.065008 [arXiv:hep-th/02052 11 [hep-th]].

237. E. J. Ahn, M. Cavaglia and A. V. Olinto, "Brane factories," Phys. Lett. B **551**, 1-6 (2003) doi:10.1016/S0370-2693(02)03011-3 [arXiv:hep-th/0201042 [hep-th]].

238. M. Cavaglia and A. Fabbri, "Quantum gravitational corrections to black hole geometries," Phys. Rev. D **65**, 044012 (2002) doi:10.1103/PhysRevD.65.044012 [arXiv:hep-th/0108050 [hep-th]].

239. M. Cadoni, P. Carta, M. Cavaglia and S. Mignemi, "Conformal dynamics of 0-branes," Phys. Rev. D **65**, 024002 (2002) doi:10.1103/PhysRevD.65.024002 [arXiv:hep-th/ 0105113 [hep-th]].

240. M. Cavaglia, "Pre - big bang in M theory," Class. Quant. Grav. **18**, 1355-1368 (2001) doi:10.1088/0264-9381/18/7/316 [arXiv:hep-th/0103095 [hep-th]].

241. M. Cavaglia, "Reply to '2D gravity without test particles is pointless (Comment on hep-th/0011136)'," Mod. Phys. Lett. A **16**, 1601-1604 (2001) doi:10.1142/S021773230100 4947

242. M. Cavaglia, "A Note on Weyl transformations in two-dimensional dilaton gravity," Mod. Phys. Lett. A **15**, 2113-2118 (2000) doi:10.1142/S0217732300002437 [arXiv:hep-th/0011136 [hep-th]].

243. M. Cavaglia and P. Vargas Moniz, "Canonical and quantum FRW cosmological solutions in M theory," Class. Quant. Grav. **18**, 95-120 (2001) doi:10.1088/0264-9381/18/1/307 [arXiv:hep-th/0010280 [hep-th]].

244. M. Cadoni and M. Cavaglia, "Open strings, 2-D gravity and AdS / CFT correspondence," Phys. Rev. D **63**, 084024 (2001) doi:10.1103/PhysRevD.63.084024 [arXiv:hep-th/0008084 [hep-th]].

245. M. Cadoni and M. Cavaglia, "Two-dimensional black holes as open strings: A New realization of the AdS / CFT duality," Phys. Lett. B **499**, 315-320 (2001) doi:10.1016/S0370-2693(00)01398-8 [arXiv:hep-th/0005179 [hep-th]].

246. M. Cavaglia and C. Ungarelli, "Quantum gravity corrections to the Schwarzschild mass," Phys. Rev. D **61**, 064019 (2000) doi:10.1103/PhysRevD.61.064019 [arXiv:hep-th/9912024 [hep-th]].

247. M. Cavaglia and V. de Alfaro, "Static quantization of two-dimensional dilaton gravity and black holes," Grav. Cosmol. **5**, 161-166 (1999) [arXiv:hep-th/9907052 [hep-th]].

248. M. Cavaglia, "The Birkhoff theorem for topologically massive gravity," Grav. Cosmol. **5**, 101-103 (1999) [arXiv:gr-qc/9904047 [gr-qc]].

249. M. Cavaglia and C. Ungarelli, "Canonical and path integral quantization of string cosmology models," Class. Quant. Grav. **16**, 1401-1415 (1999) doi:10.1088/0264-9381/16/4/028 [arXiv:gr-qc/9902004 [gr-qc]].

250. M. Cavaglia, "Geometrodynamical formulation of two-dimensional dilaton gravity," Phys. Rev. D **59**, 084011 (1999) doi:10.1103/PhysRevD.59.084011 [arXiv:hep-th/9811 059 [hep-th]].

251. M. Cavaglia, "Approximate canonical quantization for cosmological models," Int. J. Mod. Phys. D **8**, 101 (1999) doi:10.1142/S0218271899000092 [arXiv:gr-qc/9811025 [gr-qc]].

252. M. Cavaglia, "A Solvable model of two-dimensional dilaton gravity coupled to a massless scalar field," Phys. Rev. D **57**, 5295-5298 (1998) doi:10.1103/PhysRevD.57.5295 [arXiv:hep-th/9802013 [hep-th]].

253. M. Cavaglia, V. de Alfaro and A. T. Filippov, "Quantization of the string inspired dilaton gravity and the Birkhoff theorem," Phys. Lett. B **424**, 265-270 (1998) doi:10.1016/ S0370-2693(98)00226-3 [arXiv:hep-th/9802158 [hep-th]].

254. M. Cavaglia, L. Fatibene and M. Francaviglia, "Two-dimensional dilaton gravity coupled to massless spinors," Class. Quant. Grav. **15**, 3627-3643 (1998) doi:10.1088/0264-9381/15/11/021 [arXiv:hep-th/9801155 [hep-th]].

255. M. Cavaglia, "Two-dimensional reduced theory and general static solution for uncharged black p-branes," Phys. Lett. B **413**, 287-292 (1997) doi:10.1016/S0370-2693(97)01133-7 [arXiv:hep-th/9709055 [hep-th]].

256. M. Cavaglia, V. de Alfaro and A. T. Filippov, "The Birkhoff theorem in the quantum theory of two-dimensional dilaton gravity," Atti Accad. Sci. Torino. Sci. Fis. Mat. Natur. **131**, 65-75 (1997) [arXiv:hep-th/9704164 [hep-th]].

257. M. Cavaglia and V. de Alfaro, "Time gauge fixing and Hilbert space in quantum string cosmology," Gen. Rel. Grav. **29**, 773-787 (1997) doi:10.1023/A:1018890023591 [arXiv:gr-qc/9605020 [gr-qc]].

258. M. Cavaglia and V. de Alfaro, "Quantization of a 2-D minisuperspace model in dilaton Einstein gravity," Int. J. Mod. Phys. D **6**, 39-48 (1997) doi:10.1142/S0218271897000030 [arXiv:gr-qc/9602062 [gr-qc]].

259. M. Cavaglia, V. de Alfaro and A. T. Filippov, "Quantization of the Schwarzschild black hole," Int. J. Mod. Phys. D **5**, 227-250 (1996) doi:10.1142/S0218271896000163 [arXiv:gr-qc/9508062 [gr-qc]].

260. M. Cadoni and M. Cavaglia, "Instability of the R**3 x S**1 vacuum in low-energy effective string theory," Phys. Rev. D **52**, 2583-2586 (1995) doi:10.1103/PhysRevD.52.2583 [arXiv:hep-th/9502086 [hep-th]].

261. M. Cavaglia, V. de Alfaro and A. T. Filippov, "Hamiltonian formalism for black holes and quantization," Int. J. Mod. Phys. D **4**, 661-672 (1995) doi:10.1142/S0218271895000 442 [arXiv:gr-qc/9411070 [gr-qc]].

262. M. Cavaglia, "Can the interaction between baby universes generate a big universe?," Int. J. Mod. Phys. D **3**, 623-626 (1994) doi:10.1142/S0218271894000757 [arXiv:gr-qc/9408011 [gr-qc]].

263. M. Cavaglia, "Wormhole solutions in the Kantowski-Sachs space-time," Mod. Phys. Lett. A **9**, 1897-1904 (1994) doi:10.1142/S021773239400174X [arXiv:gr-qc/9407029 [gr-qc]].

264. M. Cadoni and M. Cavaglia, "Cosmological and wormhole solutions in low-energy effective string theory," Phys. Rev. D **50**, 6435-6443 (1994) doi:10.1103/PhysRevD.50.6435 [arXiv:hep-th/9406053 [hep-th]].

265. M. Cavaglia, "Quantum electromagnetic wormholes and geometrical description of the electric charge," Phys. Rev. D **50**, 5087-5092 (1994) doi:10.1103/PhysRevD.50.5087 [arXiv:gr-qc/9407030 [gr-qc]].

266. M. Cavaglia, V. de Alfaro and A. T. Filippov, "A Schrödinger equation for miniuniverses," Int. J. Mod. Phys. A **10**, 611-634 (1995) doi:10.1142/S0217751X95000279 [arXiv:gr-qc/9402031 [gr-qc]].

267. M. Cavaglia and V. de Alfaro, "On a quantum universe filled with Yang-Mills radiation," Mod. Phys. Lett. A **9**, 569-578 (1994) doi:10.1142/S0217732394003804 [arXiv:gr-qc/9310001 [gr-qc]].

268. M. Cavaglia, V. de Alfaro and F. de Felice, "An Anisotropic wormhole: Tunneling in time and space," Phys. Rev. D **49**, 6493-6499 (1994) doi:10.1103/PhysRevD.49.6493 [arXiv:gr-qc/9301022 [gr-qc]].

Conference proceedings (contributor)

1. E. Cuoco, J. Powell, A. Torres-Forné, R. Lynch, D. Trifirò, M. Cavaglià, I. Siong Heng and J. A.Font, "Strategy for signal classification to improve data quality for Advanced Detectors gravitational-wave searches," Nuovo Cim. C **40**, no.3, 124 (2017) doi:10.1393/ncc/i2017-17124-4

2. M. Cavaglia, M. Hendry, S. Marka, D. H. Reitze and K. Riles, "Astronomy's New Messengers: A traveling exhibit on gravitational-wave physics," J. Phys. Conf. Ser. **203**, 012115 (2010) doi:10.1088/1742-6596/203/1/012115

3. M. Cavaglia, M. Hendry, S. Marka, D. H. Reitze and K. Riles, "Astronomy's new messengers: A traveling exhibit to reach out to a young adult audience," J. Phys. Conf. Ser. **228**, 012001 (2010) doi:10.1088/1742-6596/228/1/012001

4. M. Cavaglia, M. Hendry, D. Ingram, S. Milde, D. Reitze, K. Riles, B. F. Schutz, A. L. Stuver, T. Summerscales and J. Thacker, *et al.* "Gravitational-wave Astronomy: Opening a New Window on the Universe for Students, Educators and the Public," ASP Conf. Ser. **400**, 328 (2008) [arXiv:0806.3764 [physics.ed-ph]].

5. P. Pani, V. Cardoso, M. Cadoni and M. Cavaglia, "Ergoregion instability of black hole mimickers," PoS **BHGRS**, 027 (2008) doi:10.22323/1.075.0027 [arXiv:0901.0850 [gr-qc]].

6. M. Cavaglia, "Black hole formation in particle colliders and high-energy cosmic rays: Recent results," AIP Conf. Proc. **805**, no.1, 338-341 (2005) doi:10.1063/1.2149725

7. M. Cavaglià, "Black holes from cosmic rays: Certainties and uncertainties," in: Rencontres de Moriond, Very High Energy Phenomena in the Universe, La Thuile, Italy (March 12-19, 2005).

8. R. Godang, S. B. Bracker, M. Cavaglia, L. Cremaldi, D. Summers and D. Cline, "Resolution of nearly mass degenerate Higgs bosons and production of black hole systems of known mass at a muon collider," Int. J. Mod. Phys. A **20**, 3409-3412 (2005) doi:10.1142/S0217751X05026674 [arXiv:hep-ph/0411248 [hep-ph]].

9. E. J. Ahn and M. Cavaglia, "TeV-scale gravity: Detecting black holes with cosmic ray air showers,"in: Shapiro, M.M., Stanev, T., Wefel, J.P. (eds) Neutrinos and Explosive Events in the Universe. NATO Science Series, vol 209. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3748-1_26.

10. E. J. Ahn, M. Ave, A. V. Olinto and M. Cavaglia, "Detecting TeV black holes from extensive air showers," in: The Tenth Marcel Grossmann Meeting, pp. 1515-1517 (2006), https://doi.org/10.1142/9789812704030_0143.

11. M. Cavaglia, "Nonperturbative gravitational events at the TeV scale," in: 10th Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories (MG X MMIII), 2118-2120 (2003).

12. M. Ave, E. J. Ahn, M. Cavaglia and A. V. Olinto, "Probing TeV gravity with extensive air - showers." [arXiv:astro-ph/0306344 [astro-ph]].

13. E. J. Ahn, M. Ave, M. Cavaglia and A. Olinto, "Nonperturbative gravitational events in high-energy collisions," in: International Conference on 20 Years of SUGRA and Search for SUSY and Unification (SUGRA 20), 437-441 (2003).

14. M. Cavaglia and P. Vargas Moniz, "FRW cosmological solutions in M theory," in: 9th Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories (MG 9) [arXiv:gr-qc/0011098 [gr-qc]].

15. M. Cavaglia and C. Ungarelli, "Recent developments in quantum string cosmology," Nucl. Phys. B Proc. Suppl. **88**, 355-358 (2000) doi:10.1016/S0920-5632(00)00801-X [arXiv:gr-qc/9912049 [gr-qc]].

16. M. Cavaglia, "Geometrodynamical formulation of two-dimensional dilaton gravity and the quantum Birkhoff theorem," [arXiv:hep-th/9811058 [hep-th]].

17. M. Cavaglia, "Two-dimensional dilaton gravity," AIP Conf. Proc. **453**, no.1, 442-448 (1998) doi:10.1063/1.57109 [arXiv:hep-th/9808136 [hep-th]].

18. M. Cavaglia, "Integrable models in two-dimensional dilaton gravity," in: PASCOS 1998, 786-789 (1998) [arXiv:hep-th/9808135 [hep-th]].

19. M. Cavaglia, V. de Alfaro and A. T. Filippov, "The Birkhoff theorem in the quantum theory of two-dimensional dilaton gravity," Atti Accad. Sci. Torino. Sci. Fis. Mat. Natur. **131**, 65-75 (1997) [arXiv:hep-th/9704164 [hep-th]].

20. M. Cavaglia and V. de Alfaro, "Quantization of constrained systems: Application to quantum string cosmology," in: 12th Italian Conference on General Relativity and Gravitational Physics, 273-277 (1996).

21. M. Cavaglia, V. De Alfaro and A. T. Filippov, "Quantization of the Robertson-Walker Universe," in: Quantum Systems: New Trends and Methods (QS 94), 31-46 (1994).

22. M. Cavaglia, V. de Alfaro and A. T. Filippov, "Definition of time in quantum cosmology," in: 11th Italian Congress of General Relativity and Gravitation, 375-380 (1994).

Conference proceedings (editor)

1. S. Basilakos, M. Cadoni, M. Cavaglia, T. Christodoulakis and E. C. Vagenas, "Classical and quantum gravity. Proceedings, 1st Mediterranean Conference, MCCQG 2009, Kolymbari, Crete, Greece, September 14-18, 2009,"

2. M. Cadoni, M. Cavaglia and J. E. Nelson, "Constrained dynamics and quantum gravity. Proceedings, 4th Meeting, QG'05, Gala Gonone, Italy, September 12-16, 2005," J. Phys. Conf. Ser. **33**, pp.1-474 (2006)

3. V. de Alfaro, J. E. Nelson, M. Cadoni, M. Cavaglia and A. Filippov, "Constrained dynamics and quantum gravity. Proceedings, 3rd Meeting, QG'99, Villasimius, Italy, September 13-17, 1999."

4. V. de Alfaro, J. E. Nelson, G. Bandelloni, A. Blasi, M. Cavaglia and A. T. Filippov, "Constrained dynamics and quantum gravity 1996. Proceedings, 2nd Meeting, QG'96, on the occasion of Tullio Regge's 65th birthday, Santa Margherita Ligure, Italy, September 17-21, 1996."

5. M. Carfora, M. Cavaglia, P. Fre, C. Reina, A. Treves, M. Francaviglia and G. Pizzella, "General relativity and gravitational physics. Proceedings, 11th Italian Conference, Trieste, Italy, September 26-30, 1994."

Appendix B: List of oral presentations since 2019

Invited talks at conferences

1. *Discovering gravitational waves with machine learning.* Machine learning in GW search: g2net next challenges, European cost action CA17137 - A network for gravitational waves, geophysics and machine learning (2021) [**keynote**].

2. *Burst group update.* Fall 2022 general conference of the LIGO Scientific, Virgo, and KAGRA collaborations (2022) [**plenary**].

3. *Burst group update.* Spring 2022 general conference of the LIGO Scientific, Virgo, and KAGRA collaborations (2022) [**plenary**].

4. *Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy: closing remarks.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Institute for Pure and Applied Mathematics, UCLA, (2021) [**keynote**].

5. *Think out of the (counting) box.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Institute for Pure and Applied Mathematics, UCLA, (2021)[**plenary**].

6. *The characterization of ground-based gravitational-wave detector data.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Institute for Pure and Applied Mathematics, UCLA, (2021) [**plenary**].

7. *'Silence, Please!' The endless fight against (detector) noise to catch Einstein's unfinished symphony.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Institute for Pure and Applied Mathematics, UCLA, (2021) [**plenary**].

8. *Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy: opening remarks.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Institute for Pure and Applied Mathematics, UCLA, (2021) [**keynote**].

9. *Gravitational-wave science with machine learning.* Second Symposium on Artificial Intelligence for Science, Industry and Society, Session 2: Astrophysics and Astronomy, Mexico City (2021) [**plenary**].

10. *Characterization of gravitational-wave detector data with fractal analysis – part II.* "g2net" Training School on Machine Learning for Advanced Control Techniques (2021) [**plenary**].

11. *Characterization of gravitational-wave detector data with fractal analysis.* "g2net" Training School on Machine Learning for Advanced Control Techniques (2021) [**plenary**].

12. *Burst group overview and plans for O4.* Fall 2021 general conference of the LIGO Scientific, Virgo, and KAGRA collaborations (2021) [**plenary**].

13. *Glitch removal in ground-based interferometric gravitational-wave detectors.* Workshop on machine learning and advanced control techniques, European cost action CA17137 – A network for gravitational waves, geophysics and machine learning (2021) [**plenary**].

14. *ROUND TABLE: Machine Learning for noise removal.* Workshop on machine learning and advanced control techniques, European cost action CA17137 - A network for gravitational waves, geophysics and machine learning (2021) [**plenary**].

15. *Burst Group Summary.* Spring 2021 general conference of the LIGO Scientific and Virgo Collaborations (2021) [**plenary**].

16. *Burst Group Summary.* Fall 2020 general conference of the LIGO Scientific and Virgo Collaborations (2020) [**plenary**].

17. *Status of LIGO-Virgo burst source searches.* Spring 2020 general conference of the LIGO Scientific and Virgo Collaborations (2020) [**plenary**].

18. *Black holes: Astrophysics final frontier.* 28th Annual Meeting of the NASA - Missouri Space Grant Consortium (2019) [**keynote**].

19. *NNETFIX: A Neural Network to 'fix' Gravitational Wave signals overlapping with glitches in LIGO-Virgo data.* Institute for Pure and Applied Mathematics, UCLA, (2019) [**plenary**].

20. *Status of LIGO-Virgo burst source searches.* Spring 2019 general conference of the LIGO Scientific and Virgo Collaborations (2019) [**plenary**].

Contributed talks at conferences

1. *Characterization of gravitational-wave detector noise with fractals.* April meeting of the American Physical Society (2022).

2. *Gravitational-wave detection with convolutional neural networks.* Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy long program, Institute for Pure and Applied Mathematics, UCLA, (2021).

3. *Detection and waveform reconstruction of gravitational-wave signals with coherent Wave Burst and Wavelet Detection Filter methods* (with graduate student Y. Zheng). April meeting of the American Physical Society (2021).

4. *Improving the chances of gravitational-wave detection from core-collapse supernovae with a single interferometer.* 22nd edition of the International Conference on General Relativity and Gravitation, "GR22" and 13th edition of the Edoardo Amaldi Conference on Gravitational Waves, "Amaldi13" (2019).

5. *NNETFIX: A neural network to 'fix' Gravitational Wave signals overlapping with short-duration glitches in LIGO-Virgo data.* April meeting of the American Physical Society (2019).

Invited colloquia and seminars

1. *Fractal analysis of LIGO data a.k.a. How to characterize interferometric noise in low latency.* g2net WG3 seminar series, European Union Cost Action CA17137 - A network for Gravitational Waves, Geophysics and Machine Learning (2021) [**seminar**].

2. *Gravitational Waves.* Missouri S&T Chemistry Department (2021) [**colloquium**].

3. *The 2020 Nobel Prize in Physics: Black Holes and the Milky Way's Darkest Secret* (with Dr. S. Saito). Missouri University S&T (2020) [**colloquium**].

4. *Unraveling the Universe's Deepest Mysteries with Gravitational Waves.* University of Missouri-St. Louis (2019) [**colloquium**].

5. *Unraveling the Universe's deepest mysteries with gravitational waves.* Missouri State University-Springfield (2019) [**colloquium**].

6. *Improving the chances of gravitational-wave detection from core-collapse supernovae with a single interferometer.* University of Wisconsin-Milwaukee (2019) [**colloquium**].

Presentations at internal meetings of the LIGO Scientific Collaboration

1. *Petition to change the author list format of the (standby) O3 supernova search paper.LIGO Scientific Collaboration Council* (2023).

2. *O3 remaining burst papers.* LIGO-Virgo-KAGRA Data Analysis Council (2023).

3. *Report about plans for supernova O4 papers.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

4. *Presentation about O4 burst binary black hole papers.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

5. *O4 magnetar paper plan presentation.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

6. *O4 fast radio burst search.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

7. *O4 gravitational-wave+high energy neutrino exceptional event paper (+sub-threshold paper).* LIGO-Virgo-KAGRA Data Analysis Council (2022).

8. *O3 supernova search paper plan.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

9. *Getting ready for a Burst (non-CBC) detection.* fall face-to-face meeting of the LIGO-Virgo-KAGRA Burst Sources Working Group (2022).

10. *Burst all-sky pipeline benchmark project.* Fall face-to-face meeting of the LIGO-Virgo-KAGRA Burst Sources Working Group (2022).

11. *Missouri S&T 2022-23 low-latency work plan.* LIGO-Virgo-KAGRA low-latency Working Group (2022).

12. *Missouri S&T 2022-23 compact binary coalescence work plan.* LIGO-Virgo-KAGRA Compact Binary Coalescence Working Group (2022).

13. *Missouri S&T 2022-23 burst work plan.* LIGO-Virgo-KAGRA Burst Sources Working Group (2022).

14. *Missouri S&T 2022-23 detector characterization work plan.* LIGO-Virgo-KAGRA detector characterization Working Group (2022).

15. *All-sky short duration paper plan presentation.* LIGO-Virgo-KAGRA Data Analysis Council (2022).

16. *Genetic Programming approach to EM-Bright Classification.* LIGO-Virgo-KAGRA low-latency Working Group (2022).

17. *Long-duration all-sky search.* LIGO-Virgo-KAGRA Burst Sources Working Group (2022).

18. *Genetic Programming approach for EM-Bright classification in low-latency.* LIGO-Virgo-KAGRA low-latency Working Group (2021).

19. *DQ Follow-up of low FAP Magnetar flares.* LIGO-Virgo-KAGRA Burst Sources Working Group (2021).

20. *Interesting magnetar triggers.* LIGO-Virgo-KAGRA Burst Sources Working Group (2021).

21. *Impact of overall calibration errors on sky localization of burst-like GW sources.* LIGO-Virgo-KAGRA calibration Working Group (2021).

22. *Using supervised learning algorithms as a follow-up method in the search of gravitational waves from core-collapse supernovae.* LIGO-Virgo-KAGRA supernova Working Group (2021).

23. *Missouri S&T 2021-22 low-latency work plan.* LIGO-Virgo-KAGRA low-latency Working Group (2021).

24. *Missouri S&T 2021-22 compact binary coalescence work plan.* LIGO-Virgo-KAGRA Compact Binary Coalescence Working Group (2021).

25. *Missouri S&T 2021-22 burst work plan.* LIGO-Virgo-KAGRA Burst Sources Working Group (2021).

26. *Missouri S&T 2021-22 detector characterization work plan.* LIGO-Virgo-KAGRA detector characterization Working Group (2021).

27. *Noise reduction in single interferometer cWB searches of CCSNe GW with supervised learning.* LIGO-Virgo-KAGRA supernova Working Group (2021).

28. *Effects of calibration errors on the source parameters for burst-like objects as reported by cWB.* LIGO-Virgo-KAGRA calibration Working Group (2020).

29. *LIGO-Virgo-KAGRA Advisory Council committee update.* LIGO Scientific Collaboration Council (November 2020).

30. *Machine and Deep Learning to enhance multipole and single IFO searches with cWB.* LIGO-Virgo-KAGRA supernova Working Group (2020).

31. *Missouri S&T 2020-21 burst work plan.* LIGO-Virgo-KAGRA Burst Sources Working Group (2020).

32. *Missouri S&T 2020-21 detector characterization work plan.* LIGO-Virgo-KAGRA detector characterization Working Group (2020).

33. *Two-dimensional correlation function of binary black hole coalescences.* LIGO-Virgo-KAGRA rates and populations Working Group (2020).

34. *LIGO-Virgo-KAGRA Advisory Council committee update.* LIGO Scientific Collaboration Council (spring 2020).

35. *Estimating glitch-contaminated portion of signal and effect on sky localization.* LIGO-Virgo-KAGRA detector characterization Working Group (2020).

36. *Origins of glitches in LIGO detectors.* LIGO-Virgo-KAGRA detector characterization Working Group (2019).

37. *Machine learning application to LIGO-Virgo single-interferometer core collapse supernova search.* LIGO-Virgo-KAGRA Burst Sources Working Group (2019).

Posters at conferences

1. *GRITS: Genetic Rapid Inference for Trigger Sources.* "Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy" long program, Workshop I: Computational Challenges in Multi-Messenger Astrophysics, Institute for Pure and Applied Mathematics, UCLA, (2021).

2. *NNETFIX: An artificial neural network-based denoising engine for gravitational-wave.* Annual fall general conference of the LIGO Scientific and Virgo Collaborations (2020).

Public talks

1. *Black holes: Astrophysics final frontier.* Meramec Vineyards Winery, St. James, MO, (2022).

2. *The Science Behind Black Holes.* 2022 SciFest Engineering Expo, Saint Louis Science Center, St. Louis, MO, (2022).

3. *Q&A about black holes.* St. Louis Astronomical Society (2020).

4. *Gravitational waves.* Society of Physics Students at Missouri S&T (2020).

5. *Black holes: Astrophysics' final frontier.* St. Louis Astronomical Society (2020).

6. *Missouri's window to the sky.* 2020 Global Learning speaker series, Missouri S&T (2020).

7. *The Science Behind Black Holes.* 2020 SciFest Engineering Expo, Saint Louis Science Center, St. Louis, MO, (2020).
8. *Gravitational waves: Astrophysics' final frontier.* St. Louis Astronomical Society (2019).
9. *Listening to black holes with gravitational waves.* Space Week, Missouri S&T (2019).
10. *Missouri's new window to the sky.* Dean's Leadership Council Fall Meeting (2019).
11. *Missouri's New Window to the Universe.* We Dig Research, Missouri S&T (2019).
12. *DYI: Gravitational waves.* S&T Astronomical Research Society (STARS) (2019).
13. *Gravitational-wave research at S&T.* S&T Astronomical Research Society (STARS) (2019).
14. *Unraveling the Universe's Deepest Mysteries with Gravitational Waves.* Science-on-Tap lecture series, Public House Brewery (2019).

Appendix C: student evaluation of teaching

Summary of student evaluation of teaching at Missouri S&T (2019 – present):

Course information	Title	Evaluations	Enrolled	Effectiveness average
PHYSICS 2135 – 204 (FS22)	Engineering Physics II	4	18	4.00
PHYSICS 2135 – 207 (FS22)	Engineering Physics II	11	26	3.54
PHYSICS 4553 – 101 (SP22)	Astrophysics	4	13	3.00
PHYSICS 2135 – 209 (SP21)	Engineering Physics II	5	16	3.40
PHYSICS 2135 – 211 (SP21)	Engineering Physics II	8	33	3.38
PHYSICS 5000 – 601 (SP22)	Special Problems	2	4	2.50
PHYSICS 2135 – 210 (FS20)	Engineering Physics II	10	37	3.30
PHYSICS 2135 – 214 (FS20)	Engineering Physics II	11	39	3.64
PHYSICS 4553 – 101 (SP20)	Astrophysics	11	15	3.18
PHYSICS 2135 – 214 (FS19)	Engineering Physics II	5	29	3.60
PHYSICS 2135 – 216 (FS19)	Engineering Physics II	15	35	3.33
PHYSICS 2135 – 2J (SP19)	Engineering Physics II	10	32	3.70
PHYSICS 2135 – 2L (SP19)	Engineering Physics II	14	34	3.86

Average student evaluation of teaching (2019 – present): 3.42/4.00.

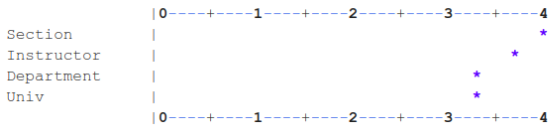
Fall semester 2022: PHYSICS 2135 204 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 204**	Term:	**FS2022**

Number Responding: **4** Number Enrolled: **18** Percent Responding: **22.22%** Effectiveness: **4.00**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	0	0	4	0	4.0	3.7	3.3	3.3
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	0	0	4	0	4.0	3.7	3.3	3.3
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	0	0	4	0	4.0	3.9	3.6	3.5
I would tell other students that the instructor was prepared for class.	0	0	0	0	4	0	4.0	3.9	3.6	3.5
I would recommend this instructor to other students.	0	0	0	0	4	0	4.0	3.9	3.3	3.2
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Knowledgeable About Subject Matter (for example, appropriately answers students' questions; provides value beyond required texts)	0	0	0	0	4	0	4.0	3.9	3.7	3.6
Establishes Learning Objectives (for example, prepares/follows the syllabus; has clear learning objectives)	0	0	0	0	4	0	4.0	3.7	3.6	3.5
Uses Relevant Assessments (for example, assignments/tests target key learning objectives)	0	0	0	0	4	0	4.0	3.8	3.5	3.5
Provides Constructive Feedback (for example, provides useful, timely feedback on returned work)	0	0	0	1	3	0	3.8	3.7	3.4	3.2
Accessible (for example, posts/attends office hours, gives contact information, responds in a reasonable amount of time)	0	0	0	0	4	0	4.0	3.5	3.5	3.5
Attentive to Student Learning (for example, asks questions to check student understanding; reinforce information when necessary)	0	0	0	0	4	0	4.0	3.7	3.4	3.4
Engaging and Interesting (for example, uses relevant examples; supports and enhances lectures with educational tools and/or technology)	0	0	0	0	4	0	4.0	3.7	3.4	3.3
Receptive to feedback (for example, requests course feedback from students; responds to student suggestions)	0	0	0	0	4	0	4.0	3.7	3.4	3.3
Respectful (for example, is considerate and polite, encourages students, promotes an inclusive environment)	0	0	0	0	4	0	4.0	3.9	3.7	3.7

Graph of teacher effectiveness averages (Question 7)



Student Comments

With regards to teaching, what are the strengths of the instructor?
The instructor was, I thought, all-around excellentâ€"nothing to complain about.
He is incredibly knowledgeable, easy to understand, asks lots of questions and provides plenty of visuals and other useful information we donâ€™t get in lecture. Often times I look forward to recitation because of how much better I understand the material with Cavaglia. He is an amazing professor that I wish taught the lecture as well.
Cavaglia is a very compassionate and intelligent instructor. He clearly has a very solid understanding of the course material and does a great job of communicating the concepts to his students.

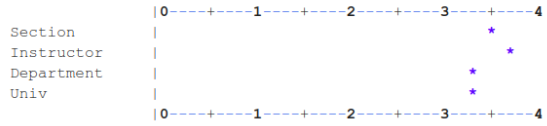
Fall semester 2022: PHYSICS 2135 207 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 207**	Term:	**FS2022**

Number Responding: **11** Number Enrolled: **26** Percent Responding: **42.31%** Effectiveness: **3.54**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently	Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	2	1	8	0	3.5	3.7	3.3	3.3
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	1	2	8	0	3.6	3.7	3.3	3.3
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	0	2	9	0	3.8	3.9	3.6	3.5
I would tell other students that the instructor was prepared for class.	0	0	0	2	9	0	3.8	3.9	3.6	3.5
I would recommend this instructor to other students.	0	0	0	2	9	0	3.8	3.9	3.3	3.2
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Knowledgeable About Subject Matter (for example, appropriately answers students' questions; provides value beyond required texts)	0	0	0	2	9	0	3.8	3.9	3.7	3.6
Establishes Learning Objectives (for example, prepares/follows the syllabus; has clear learning objectives)	0	0	1	3	7	0	3.5	3.7	3.6	3.5
Uses Relevant Assessments (for example, assignments/tests target key learning objectives)	0	0	0	3	8	0	3.7	3.8	3.5	3.5
Provides Constructive Feedback (for example, provides useful, timely feedback on returned work)	0	0	0	4	7	0	3.6	3.7	3.4	3.2
Accessible (for example, posts/attends office hours, gives contact information, responds in a reasonable amount of time)	0	0	2	3	6	0	3.4	3.5	3.5	3.5
Attentive to Student Learning (for example, asks questions to check student understanding; reinforce information when necessary)	0	0	1	2	8	0	3.6	3.7	3.4	3.4
Engaging and Interesting (for example, uses relevant examples; supports and enhances lectures with educational tools and/or technology)	0	0	1	2	8	0	3.6	3.7	3.4	3.3
Receptive to feedback (for example, requests course feedback from students; responds to student suggestions)	0	0	0	4	7	0	3.6	3.7	3.4	3.3
Respectful (for example, is considerate and polite, encourages students, promotes an inclusive environment)	0	0	0	1	10	0	3.9	3.9	3.7	3.7

Graph of teacher effectiveness averages (Question 7)



Student Comments

With regards to teaching, what are the strengths of the instructor?
Instructor was able to fix any questions left over from lecture effectively allowing for a fuller understanding of the topics.
He would do a great job at actually teaching the material that should have been taught in the lecture. He elaborates on the problems to make it easier to understand.
He connects very well with the students and knows how to communicate the material to them.
I loved having Dr. Cavaglia as my recitation instructor. His enthusiasm and humor is a joy to experience on days when I really don't feel like going to class.
very kind, and a good source of positive vibes
Very knowledgeable about relevant course material.
Engaging with students and knowledge about subject.
He is a good teacher with a personality and he teaches well.

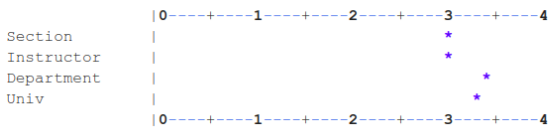
Spring semester 2022: PHYSICS 4553 101 (Astrophysics).

Instructor:	**Cavaglia,Marco**	Title:	**Astrophysics**
Section(s):	**PHYSICS 4553 101**	Term:	**SP2022**

Number Responding: **4** Number Enrolled: **13** Percent Responding: **30.77%** Effectiveness: **3.00**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently	Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	1	2	1	0	3.0	3.0	3.4	3.3
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	1	3	0	0	2.8	2.8	3.4	3.3
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	1	0	3	0	3.5	3.5	3.6	3.5
I would tell other students that the instructor was prepared for class.	0	0	0	1	3	0	3.8	3.8	3.6	3.5
I would recommend this instructor to other students.	0	0	2	0	2	0	3.0	3.0	3.3	3.2
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Knowledgeable About Subject Matter (for example, appropriately answers students' questions; provides value beyond required texts)	0	0	0	0	4	0	4.0	4.0	3.7	3.6
Establishes Learning Objectives (for example, prepares/follows the syllabus; has clear learning objectives)	0	0	2	1	1	0	2.8	2.8	3.6	3.5
Uses Relevant Assessments (for example, assignments/tests target key learning objectives)	0	1	1	1	1	0	2.5	2.5	3.6	3.4
Provides Constructive Feedback (for example, provides useful, timely feedback on returned work)	0	1	0	1	2	0	3.0	3.0	3.4	3.2
Accessible (for example, posts/attends office hours, gives contact information, responds in a reasonable amount of time)	0	0	0	1	3	0	3.8	3.8	3.5	3.4
Attentive to Student Learning (for example, asks questions to check student understanding; reinforce information when necessary)	0	1	1	1	1	0	2.5	2.5	3.4	3.4
Engaging and Interesting (for example, uses relevant examples; supports and enhances lectures with educational tools and/or technology)	0	0	1	1	2	0	3.2	3.2	3.4	3.3
Receptive to feedback (for example, requests course feedback from students; responds to student suggestions)	0	0	0	1	3	0	3.8	3.8	3.3	3.3
Respectful (for example, is considerate and polite, encourages students, promotes an inclusive environment)	0	0	0	0	4	0	4.0	4.0	3.7	3.6

Graph of teacher effectiveness averages (Question 7)



Student Comments

With regards to teaching, what are the strengths of the instructor?
Personable and makes the course material fun to learn.
Very likable and humorous. Able to answer questions with meaningful feedback.
Dr. Cavaglia is incredibly knowledgeable and fun to talk to. He also seems concerned for our understanding of the material.

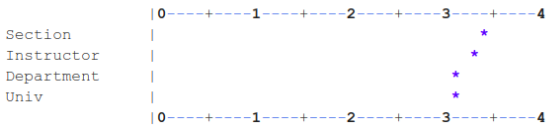
Spring semester 2021: PHYSICS 2135 209 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 209**	Term:	**SP2021**

Number Responding: **5** Number Enrolled: **16** Percent Responding: **31.25%** Effectiveness: **3.40**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	1	1	3	0	3.4	3.3	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	0	3	2	0	3.4	3.1	3.2	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	1	0	0	1	3	0	3.0	3.0	3.4	3.3
I would tell other students that the instructor was prepared for class.	0	0	1	1	3	0	3.4	3.2	3.4	3.3
I would recommend this instructor to other students.	0	0	1	2	2	0	3.2	3.2	3.2	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	1	0	2	0	2	0	2.4	2.4	2.8	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	1	0	0	2	2	0	2.8	2.7	3.0	3.1
Rate the instructor's concern for your understanding of the material.	0	0	1	1	3	0	3.4	3.4	3.2	3.2
Rate the instructor's preparation for class.	0	0	1	2	2	0	3.2	3.3	3.4	3.3
Rate the instructor's ability to communicate.	0	0	0	2	3	0	3.6	3.5	3.1	3.1
Rate the instructor's ability to stimulate and motivate you.	1	0	0	2	2	0	2.8	3.0	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
The instructor definitely taught the class well and interacted with the students.
Strengths: Dr. Cavaglia is amazing! He is very personable and knowledgeable when it comes to the course and its inner workings. I appreciate the enthusiasm he has for the course and for helping his students. Weaknesses: None!

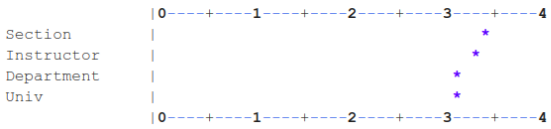
Spring semester 2021: PHYSICS 2135 211 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 211**	Term:	**SP2021**

Number Responding: **8** Number Enrolled: **33** Percent Responding: **24.24%** Effectiveness: **3.38**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently	Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	0	5	3	0	3.4	3.3	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	1	5	2	0	3.1	3.1	3.2	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	1	0	4	3	0	3.1	3.0	3.4	3.3
I would tell other students that the instructor was prepared for class.	0	0	1	4	3	0	3.2	3.2	3.4	3.3
I would recommend this instructor to other students.	0	0	1	3	4	0	3.4	3.2	3.2	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	0	2	3	0	3	0	2.5	2.4	2.8	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	0	0	3	2	2	1	2.9	2.7	3.0	3.1
Rate the instructor's concern for your understanding of the material.	0	0	0	3	5	0	3.6	3.4	3.2	3.2
Rate the instructor's preparation for class.	0	0	1	2	5	0	3.5	3.3	3.4	3.3
Rate the instructor's ability to communicate.	0	0	1	1	6	0	3.6	3.5	3.1	3.1
Rate the instructor's ability to stimulate and motivate you.	0	0	1	4	3	0	3.2	3.0	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
N/A
Professor Cavaglia was very knowledgeable over the material we discussed. He could always explain a problem more, different ways of solving it and was very helpful when asked questions. Professor Cavaglia was quick with his email responses always answering within a few hours and was very willing to grade extra work that did not count just so we could get a better understanding of the material. The only weakness I saw with this professor was that he did not have the best understanding of the course. He was often unsure of what a test would be over and was unable to accurately answer a question about what the tests material would contain. I can not blame him for this fully though as I believe this is the fault of some spotty communication in the department. This was nothing too serious though.
Learned more in the RSD than I did in the lectures. Demonstrated that he cared for our grades and explained how to apply formulas/ when to use formulas.
He really really cares about the students and how he's teaching. He is always making sure we understand what is going on and always offers to explain or do more.

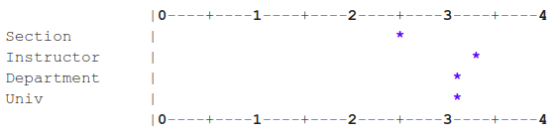
Spring semester 2021: PHYSICS 5000 211 (Special problems).

Instructor:	**Cavaglia,Marco**	Title:	**Special Problems**
Section(s):	**PHYSICS 5000 601**	Term:	**SP2021**

Number Responding: **2** Number Enrolled: **4** Percent Responding: **50.00%** Effectiveness: **2.50**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	1	0	0	1	0	2.5	3.3	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	1	0	0	1	0	2.5	3.1	3.2	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	1	0	0	1	0	2.5	3.0	3.4	3.3
I would tell other students that the instructor was prepared for class.	0	1	0	0	1	0	2.5	3.2	3.4	3.3
I would recommend this instructor to other students.	0	1	0	0	1	0	2.5	3.2	3.2	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	1	0	0	0	1	0	2.0	2.4	2.8	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	1	0	0	0	1	0	2.0	2.7	3.0	3.1
Rate the instructor's concern for your understanding of the material.	0	1	0	0	1	0	2.5	3.4	3.2	3.2
Rate the instructor's preparation for class.	0	1	0	0	1	0	2.5	3.3	3.4	3.3
Rate the instructor's ability to communicate.	0	1	0	0	1	0	2.5	3.5	3.1	3.1
Rate the instructor's ability to stimulate and motivate you.	0	1	0	0	1	0	2.5	3.0	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

N/A

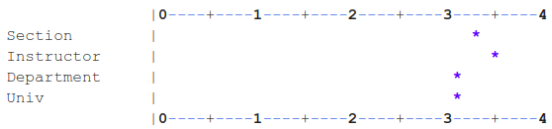
Fall semester 2020: PHYSICS 2135 210 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 210**	Term:	**FS2020**

Number Responding: **10** Number Enrolled: **37** Percent Responding: **27.03%** Effectiveness: **3.30**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	1	0	1	1	7	0	3.3	3.5	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	1	0	1	2	6	0	3.2	3.4	3.1	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	1	2	7	0	3.6	3.7	3.3	3.3
I would tell other students that the instructor was prepared for class.	0	0	0	2	8	0	3.8	3.7	3.3	3.3
I would recommend this instructor to other students.	1	0	1	2	6	0	3.2	3.4	3.1	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	3	1	2	2	2	0	1.9	2.4	2.7	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	1	1	1	2	5	0	2.9	3.1	3.0	3.1
Rate the instructor's concern for your understanding of the material.	0	0	2	2	6	0	3.4	3.6	3.1	3.2
Rate the instructor's preparation for class.	0	0	2	2	6	0	3.4	3.6	3.3	3.3
Rate the instructor's ability to communicate.	1	0	1	2	6	0	3.2	3.3	3.1	3.1
Rate the instructor's ability to stimulate and motivate you.	1	0	2	3	4	0	2.9	3.1	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
Strengths: He listened to our input and made sure to make adjustments if need be. I really enjoy how he asked for volunteers for board work. Weaknesses: He is such a genius when it comes to physics that often times he thought topics were easy but in reality to students its very difficult.
Strengths: genuinely wants to teach the students how to do the coursework, covers the material thoroughly Weaknesses: a little confusing when picking people for board work, but that's mostly because of the Zoom setting for the class
Professor Cavaglia is awesome and I really enjoyed having him as a recitation instructor. He took mid-semester constructive criticism and actually changed how he taught. He tried to get us to participate, he gave a great overview of lecture material, and I really liked how he listened to our feedback over whether or not we wanted the TLPs collected.
Dr. Cavaglia was always willing to help me out when I needed extra assistance and was there for me when I needed a small extension on an assignment or two. He very effectively explained the course material and never made me feel like I was asking "stupid" questions.
He explains the concept of the the day very well. He occasionally has issues with time management for the class.
stengths: made sure wer understood the material weaknesses: never went over the homework in recitation so most days I had little to no idea if I did the homework right or how to do certain homework problems until they were posted on the course website

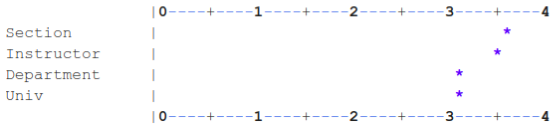
Fall semester 2020: PHYSICS 2135 214 (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 214**	Term:	**FS2020**

Number Responding: **11** Number Enrolled: **39** Percent Responding: **28.21%** Effectiveness: **3.64**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	1	2	8	0	3.6	3.5	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	0	4	7	0	3.6	3.4	3.1	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	0	3	8	0	3.7	3.7	3.3	3.3
I would tell other students that the instructor was prepared for class.	0	0	0	4	7	0	3.6	3.7	3.3	3.3
I would recommend this instructor to other students.	0	0	0	5	6	0	3.5	3.4	3.1	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	0	1	3	3	4	0	2.9	2.4	2.7	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	0	0	1	4	5	1	3.4	3.1	3.0	3.1
Rate the instructor's concern for your understanding of the material.	0	0	0	3	8	0	3.7	3.6	3.1	3.2
Rate the instructor's preparation for class.	0	0	0	3	8	0	3.7	3.6	3.3	3.3
Rate the instructor's ability to communicate.	0	0	1	5	5	0	3.4	3.3	3.1	3.1
Rate the instructor's ability to stimulate and motivate you.	0	0	1	6	4	0	3.3	3.1	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
Very receptive to feedback and willing to work with us to make the class better. Very good at explaining concepts in a way that is easy to understand. Very patient and willing to answer student's questions thoroughly, even if class time is already over.
good at explaining the topics in a different and more simple way than the lecture material. Didn't overload us with new info but rather clarified older information
This guy is great. A recitation instructor has a lot of responsibility, as I believe that the real learning in Physics happens not in lecture, but in recitation. He teaches in a way that makes things easier to understand after having no clue what was going on in lecture. I didn't see any big weaknesses.
He does a great job explaining concepts that are very challenging to me. He did a great job laying out the grading scale and had grades back in about a day

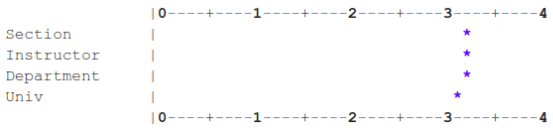
Spring semester 2020: PHYSICS 4553 101 (Astrophysics).

Instructor:	**Cavaglia,Marco**	Title:	**Astrophysics**
Section(s):	**PHYSICS 4553 101**	Term:	**SP2020**

Number Responding: **11** Number Enrolled: **15** Percent Responding: **73.33%** Effectiveness: **3.18**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	1	1	4	5	0	3.2	3.2	3.2	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	2	0	2	7	0	3.3	3.3	3.1	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	1	0	2	8	0	3.5	3.5	3.3	3.3
I would tell other students that the instructor was prepared for class.	0	0	0	3	8	0	3.7	3.7	3.3	3.3
I would recommend this instructor to other students.	0	1	1	0	9	0	3.5	3.5	3.1	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	0	0	1	1	9	0	3.7	3.7	2.9	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	0	1	3	3	4	0	2.9	2.9	3.1	3.1
Rate the instructor's concern for your understanding of the material.	0	0	1	1	9	0	3.7	3.7	3.3	3.2
Rate the instructor's preparation for class.	0	0	0	2	9	0	3.8	3.8	3.4	3.3
Rate the instructor's ability to communicate.	1	1	0	3	6	0	3.1	3.1	3.2	3.1
Rate the instructor's ability to stimulate and motivate you.	1	0	1	1	8	0	3.4	3.4	3.0	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
His biggest strength is that he really seems to enjoy what he's doing and talking about. He always came in with great energy which really helped motivate me to focus and learn the material. Another strength is that he really knows the material and does a good job conveying it.
he always came into class in a good mood
The turtle neck sweaters were on point and I enjoyed the use of the actual textbook with your own notes written in for clarification.
Strengths: passion and understanding for material, ability to explain is great
I think it's important to state that this is Cavaglia's first time teaching this course (and I'm not sure if hes had a teaching position in the past, because he was a researcher), so I'm not too surprised that he sometimes explained stuff poorly, but this is debatably offset by the fact that he is super qualified to teach this subject, he is super knowledgeable about the subject matter of the class and therefore is great to ask questions if you need something explained differently. Despite this, he isn't extremely helpful if you have a question on the homework because he tries to guide you to the answer rather than outright tell, which can be both annoying and unhelpful at times, if you genuinely don't get what's going on.
The first two chapters moved a little bit too quickly for me, but then we settled into a rhythm that was attainable and engaging.
Strength- Passion for material Weakness- Inability to communicate or motivate students on material

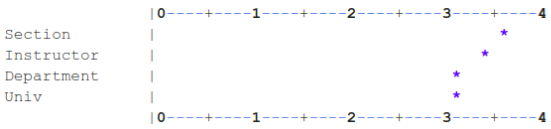
Fall semester 2019: PHYSICS 2135 2J (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 214**	Term:	**FS2019**

Number Responding: **5** Number Enrolled: **29** Percent Responding: **17.24%** Effectiveness: **3.60**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	0	0	2	3	0	3.6	3.4	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	0	0	0	2	3	0	3.6	3.3	3.0	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	0	0	0	2	3	0	3.6	3.4	3.4	3.3
I would tell other students that the instructor was prepared for class.	0	0	0	2	3	0	3.6	3.4	3.4	3.3
I would recommend this instructor to other students.	0	0	0	2	3	0	3.6	3.2	3.1	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	0	0	2	2	1	0	2.8	2.4	2.7	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	0	0	0	3	1	1	3.2	3.0	2.9	3.0
Rate the instructor's concern for your understanding of the material.	0	0	0	2	3	0	3.6	3.2	3.1	3.2
Rate the instructor's preparation for class.	0	0	0	2	3	0	3.6	3.4	3.4	3.3
Rate the instructor's ability to communicate.	0	0	0	1	4	0	3.8	3.5	3.0	3.1
Rate the instructor's ability to stimulate and motivate you.	0	0	0	2	3	0	3.6	3.3	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
Understood the material that he taught very well, and always showed that he wanted us to understand the material and do well in the course. Great recitation instructor, and I usually understood the material much better in this recitation than I did in the lecture with Dr. Musser.
A strength of this instructor is his enthusiasm for the material, and the way he connects with students. He is very knowledgeable about the course material and he knows how to explain it in a simple way. A minor weakness of this instructor is his tendency to get distracted and go on tangents occasionally.
Strengths: Does a great job at breaking down the physics into the basics and building up from there When solving the board work, he gives you enough hints to figure out what went wrong, usually without giving you the answer Jokes make recitation more entertaining and helps with keeping attention Weaknesses: There aren't any glaring weaknesses that I can think of.
Dr. Cavaglia was able to quickly go though the material we learned the day piror to fill in the gaps that we may have missed.

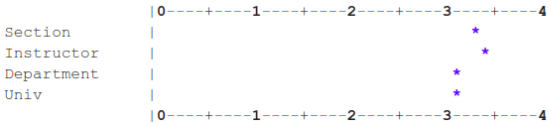
Fall semester 2019: PHYSICS 2135 2L (Engineering Physics II).

Instructor:	**Cavaglia,Marco**	Title:	**Engineering Physics II**
Section(s):	**PHYSICS 2135 216**	Term:	**FS2019**

Number Responding: **15** Number Enrolled: **35** Percent Responding: **42.86%** Effectiveness: **3.33**

	Poor / Strongly Disagree / Never		Average / Neutral / Sometimes		Excellent / Strongly Agree / Consistently		Section	Instructor	Dept	Univ
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
This instructor was an effective teacher.	0	1	3	1	10	0	3.3	3.4	3.1	3.1
Instructor ratings required by state law to be posted for consumers	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
I would tell other students that the instructor was effective in communicating the content of the course.	1	0	3	2	8	0	3.1	3.3	3.0	3.1
I would tell other students that the instructor described and consistently followed course and grading policies.	1	0	1	3	9	0	3.4	3.4	3.4	3.3
I would tell other students that the instructor was prepared for class.	0	1	1	4	8	0	3.4	3.4	3.4	3.3
I would recommend this instructor to other students.	1	1	2	2	8	0	3.1	3.2	3.1	3.1
Campus Questions	**0**	**1**	**2**	**3**	**4**	**N/A**	**Avg**	**Avg**	**Avg**	**Avg**
Evaluate this course, independent of the instructor's effectiveness, in terms of its educational value to you.	2	3	3	1	5	0	2.3	2.4	2.7	3.0
Rate the instructor's use of assignments and tests for facilitating your learning of the subject matter.	1	1	4	0	8	0	2.9	3.0	2.9	3.0
Rate the instructor's concern for your understanding of the material.	1	1	2	2	8	0	3.1	3.2	3.1	3.2
Rate the instructor's preparation for class.	1	0	2	2	9	0	3.3	3.4	3.4	3.3
Rate the instructor's ability to communicate.	1	0	1	3	9	0	3.4	3.5	3.0	3.1
Rate the instructor's ability to stimulate and motivate you.	1	1	1	2	9	0	3.2	3.3	2.8	2.9

Graph of teacher effectiveness averages (Question 7)



Student Comments

What are the strengths and weaknesses of the instructor?
* Strengths: really helpful when teaching content; teaches better than Musser; joke of the day; actually talked about Aerospace on a few days * Weaknesses: none
He was the reason why I learned anything in this course. Very fun and easy to get along with. He explained things much better than in the online lectures and would help me with problems when I needed them.
Nice guy and is passionate about physics but not passionate about physics II. His lectures in recitation would ramble on and not necessarily cover the material from the lecture. He routinely went over the allotted 50 minute time frame or lose control of the class. the exam review classes were not super helpful; he spent 20 minutes on one question while not really answering the question but rambling about a different topic altogether.
Cavaglia is great at describing concepts in a different light from the lectures and clearing up an confusion from the lectures. He is always punctual and keeps the class period on a great schedule. No weaknesses.
The instructor often failed to motivate students which are not physics majors. The instructor also hardly explained how the material was relevant to non physics majors.
Dr. Marco always came prepared. I also enjoyed the fact that he always had a joke of the day. Highly reccomend
Strengths: knew the content VERY well and was also quite funny in the process. I loved the energy he brought to recitation as well as his "jokes of the day". Weakness: Did not excuse career day, a day in which most students did not show up as a random homework-collection day. NO make-ups were possible on that day as well.
I feel that too much time is spent explaining the less important aspects of the lectures. More time could be spent with application of the lecture. However the time spent on these aspects were detailed and fairly thorough
He did a good job of going of the material in that day's lectures and being consistent throughout the semester. For the most part I would learn more in the recitation than watching the online lectures, which motivated me to continue to attend.