Kiyoshi Wesley Masui

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Personal Information

Citizenship Canadian
Languages English, French

Education

2013 Ph.D., Physics, University of Toronto
Thesis: "Advancing precision cosmology with 21 cm intensity mapping"
Advisor: Ue-Li Pen

2008 B.Sc.E., Engineering Physics, Queen's University at Kingston, First class honours
Thesis: "Radioactively inert argon"
Advisor: Arthur B. McDonald

Professional Appointments

2016 – present Canadian Institute for Theoretical Astrophysics National Fellow, University of British Columbia, Department of Physics and Astronomy

2013 – 2015 Canadian Institute for Advanced Research Global Scholar, University of British Columbia, Department of Physics and Astronomy

2013 – present Postdoctoral Fellow, University of British Columbia, Department of Physics and Astronomy

Honors and Awards

2016 – present National Fellow, Canadian Institute for Theoretical Astrophysics

2013 – 2015 Global Scholar, Canadian Institute for Advanced Research

2012 – 2013 Walter C. Sumner Memorial Fellowship, Walter C. Sumner Foundation

2012 Van Kranendonk Teaching Award, University of Toronto, Department of Physics

2010 – 2012 Alexander Graham Bell Canada Graduate Scholar—Doctoral, Natural Sciences and Engineering Research Council of Canada

2008 – 2010 Canada Graduate Scholar—Master's, Natural Sciences and Engineering Research Council of Canada

2006 – 2008 Dean's Award for Academic Excellence, Queen's University at Kingston

2004 – 2006 Principal's Scholarship, Queen's University at Kingston

2004 Nortel Networks' Scholarship, Queen's University at Kingston

2004 Governor General's Academic Metal

Publications

Articles: Led, Co-led, and Equivalent Collaboration Papers

2017 H.-H. Lin, **K. Masui**, U.-L. Pen, and J. B. Peterson, "A pulsar timing solution from hydrogen mapping data", submitted to Mon. Not. R. Astron. Soc. (2017), arXiv:1707.08581.

2017 M. Amiri, K. Bandura, P. Berger, *et al.*, "Limits on the Ultra-bright Fast Radio Burst Population from the CHIME Pathfinder", Astrophys. J. **844**, 161 (2017), arXiv:1702.08040.

2017 **K. W. Masui**, U.-L. Pen, and N. Turok, "Two- and Three-Dimensional Probes of Parity in Primordial Gravity Waves", Phys. Rev. Lett. **118**, 221301 (2017), arXiv:1702.06552.

2015 **K. Masui**, H.-H. Lin, J. Sievers, *et al.*, "Dense magnetized plasma associated with a fast radio burst", Nature **528**, 523 (2015), arXiv:1512.00529, 104 citations.

2015 **K. W. Masui** and K. Sigurdson, "Dispersion Distance and the Matter Distribution of the Universe in Dispersion Space", Phys. Rev. Lett. **115**, 121301 (2015), arXiv:1506.01704.

2015 **K. Masui**, M. Amiri, L. Connor, *et al.*, "A compression scheme for radio data in high performance computing", Astronomy and Computing **12**, 181 (2015), arXiv:1503.00638.

2013 E. R. Switzer, **K. W. Masui**, K. Bandura, *et al.*, "Determination of $z \sim 0.8$ neutral hydrogen fluctuations using the 21 cm intensity mapping autocorrelation", Mon. Not. R. Astron. Soc. **434**, L46 (2013), arXiv:1304.3712, 74 citations.

2013 **K. W. Masui**, E. R. Switzer, N. Banavar, *et al.*, "Measurement of 21 cm Brightness Fluctuations at $z \sim 0.8$ in Cross-correlation", Astrophys. J. Lett. **763**, L20 (2013), arXiv:1208.0331, 93 citations.

2010 **K. W. Masui** and U.-L. Pen, "Primordial Gravity Wave Fossils and Their Use in Testing Inflation", Phys. Rev. Lett. **105**, 161302 (2010), arXiv:1006.4181, 36 citations.

2010 **K. W. Masui**, P. McDonald, and U.-L. Pen, "Near-term measurements with 21 cm intensity mapping: Neutral hydrogen fraction and BAO at $z < 2$", Phys. Rev. D **81**, 103527 (2010), arXiv:1001.4811.

2010 **K. W. Masui**, F. Schmidt, U.-L. Pen, and P. McDonald, "Projected constraints on modified gravity cosmologies from 21 cm intensity mapping", Phys. Rev. D **81**, 062001 (2010), arXiv:0911.3552.

2008 S. P. Pecknold, **K. W. Masui**, and P. C. Hines, "Transmission loss measurements and geoacoustic sensitivity modeling at 1.2 kHz", The Journal of the Acoustical Society of America **124**, EL110 (2008).

Articles: Contributing Author

2017 C. J. Anderson, N. J. Luciw, Y.-C. Li, *et al.*, "Lack of clustering in low-redshift 21-cm intensity maps cross-correlated with with 2dF galaxy densities", submitted to Mon. Not. R. Astron. Soc. (2017), arXiv:1710.00424.

2017 L. Wolz, C. Blake, F. B. Abdalla, *et al.*, "Erasing the Milky Way: new cleaning technique applied to GBT intensity mapping data", Mon. Not. R. Astron. Soc. **464**, 4938 (2017), arXiv:1510.05453.

2016 Y.-W. Liao, T.-C. Chang, C.-Y. Kuo, **K. W. Masui**, N. Oppermann, U.-L. Pen, and J. B. Peterson, "Accurate Polarization Calibration at 800 MHz with the Green Bank Telescope", Astrophys. J. **833**, 289 (2016), arXiv:1610.04365.

2016 L. Connor, H.-H. Lin, **K. Masui**, N. Oppermann, U.-L. Pen, J. B. Peterson, A. Roman, and J. Sievers, "Constraints on the FRB rate at 700-900 MHz", Mon. Not. R. Astron. Soc. **460**, 1054 (2016), arXiv:1602.07292.

2015 E. R. Switzer, T.-C. Chang, **K. W. Masui**, U.-L. Pen, and T. C. Voytek, "Interpreting the Unresolved Intensity of Cosmologically Redshifted Line Radiation", Astrophys. J. **815**, 51 (2015), arXiv:1504.07527.

Conference Proceedings

2017 C. Ng, K. Vanderlinde, A. Paradise, *et al.*, "CHIME FRB: An application of FFT beamforming for a radio telescope", accepted to XXXIInd International Union of Radio Science General Assembly & Scientific Symposium (2017), arXiv:1702.04728.

2016 P. Berger, L. B. Newburgh, M. Amiri, *et al.*, "Holographic Beam Mapping of the CHIME Pathfinder Array", in Ground-based and Airborne Telescopes VI, Vol. 9906, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series (Aug. 2016), arXiv:1607.01473.

2015 N. Denman, M. Amiri, K. Bandura, *et al.*, "A GPU-based Correlator X-engine Implemented on the CHIME Pathfinder", in Application-specific Systems, Architectures and Processors, Institute of Electrical and Electronics Engineers (IEEE) International Conference Series (July 2015), arXiv:1503.06202.

2014 K. Bandura, G. E. Addison, M. Amiri, *et al.*, "Canadian Hydrogen Intensity Mapping Experiment (CHIME) pathfinder", in Ground-based and Airborne Telescopes V, Vol. 9145, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series (July 2014), arXiv:1406.2288.

2014 L. B. Newburgh, G. E. Addison, M. Amiri, *et al.*, "Calibrating CHIME: a new radio interferometer to probe dark energy", in Ground-based and Airborne Telescopes V, Vol. 9145, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series (July 2014), arXiv:1406.2267.

Teaching Experience

Teaching Assistantships

2012 – 2013 Physics Drop in Centre, University of Toronto, Department of Physics

2012 Foundations of Physics II, University of Toronto, Department of Physics

2011 Foundations of Physics I, University of Toronto, Department of Physics

2011 Quantum and Thermal Physics, University of Toronto, Department of Physics

2009 Introduction to Physics I, University of Toronto, Department of Physics

2009 Introduction to Physics II, University of Toronto, Department of Physics

Faculty Sponsor

2017 – 2018 Engineering Physics Project I, University of British Columbia

Undergraduate Research Supervision

2017 Tara Akhound-Sadegh, University of British Columbia

2011 – 2012 Nidhi Banavar, University of Toronto

2011 – 2012 Liviu-Mihai Calin, University of Toronto

Graduate Student Mentorship

2016 – present Tristan Pinsonneault-Marotte, University of British Columbia

2015 – present Ryley Hill, University of British Columbia

2015 – 2017 Liam Connor, University of Toronto

2014 – present Deborah Good, University of British Columbia

2014 – present Hsiu-Hsien Lin, Carnegie Mellon University

2013 – present Carolin Höfer, University of British Columbia

2012 – 2017 Christopher Anderson, University of Wisconsin—Madison

Undergraduate Student Mentorship

2014 – 2015 Alexander Roman, Carnegie Mellon University, Undergraduate

2013 – 2014 Ze Fu, University of British Columbia, Undergraduate

Contributed Public Software

2014 – present Bitshuffle, Primary author
https://github.com/kiyo-masui/bitshuffle
https://pypi.python.org/pypi/bitshuffle

2014 – present Burst Search, Maintainer and contributer
https://github.com/kiyo-masui/burst_search

2013 – present Cluster Astronomical Python Utilities, Maintainer and contributer
https://github.com/radiocosmology/caput

Grants and Allocations

Telescope allocations

2017 High Sensitivity Array, "Scintillation of FRB121102 and the associated persistent radio source", Co-Investigator, 50 hours

2017 Green Bank Telescope, "Follow-up of one candidate 21 cm absorber found by blind searching", Co-Investigator, 12 hours

2015 Green Bank Telescope, "Follow-up of two candidate 21 cm absorbers found by blind searching", Co-Investigator, 8 hours

2014 Green Bank Telescope, "Redshift space distortions with 21 cm intensity mapping in cross-correlation" (continuation), Co-Investigator, 500 hours

2014 Parkes Observatory, "HI intensity mapping: Parkes-2dFGRS and BAO science", Co-Investigator, 70 hours

2013 Green Bank Telescope, "Redshift space distortions with 21 cm intensity mapping in cross-correlation", Co-Investigator, 134 hours

2012 Green Bank Telescope, "21 cm intensity mapping with prototype receiver", Co-Investigator, 10 hours

2012 Green Bank Telescope, "Baryon acoustic oscillations with 21 cm intensity mapping", Co-Investigator, 100 hours

2011 Green Bank Telescope, "21 cm intensity mapping", Co-Investigator, 100 hours plus student support

2010 Green Bank Telescope, "Study of velocity distortions using 21 cm intensity mapping", Co-Investigator, 300 hours plus student support

Research Grants

2014 Canadian Institute for Advanced Research Global Scholar Creativity Fund, "Using the stars to test quantum mechanics", Co-Investigator, $5000 CAD for meeting support

Academic Service

Reports

2014 – 2017 Cosmology and Gravity Program Meeting Report, Coauthor, Canadian Institute for Advanced Research (four annual reports)

2010 Long Range Plan White Paper on 21 cm Cosmology, Coauthor, Canadian Astronomical Society

Events

2017 GBT Intensity Mapping Analysis Workshop, Organizer, Toronto, Oct. 2017

2012 GBT Intensity Mapping Analysis Workshop, Organizer, Toronto, May. 2012

2011 21-cm Cosmology: Advanced Data Analysis Workshop, Organizer, Toronto, June. 2011

Peer Review

Nature, Nature Astronomy, Physical Review Letters, Physical Review D, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, and Astronomy and Computing

Invited Talks

Seminars and Colloquia

2017 Physical Sciences Colloquium, Univerisity of Washington Bothell, Seattle, Nov. 2017.

2017 "Primordial gravity waves from tidal imprints in large-scale structure", Seminar, Perimeter Institute for Theoretical Physics, Waterloo, Oct. 2017.

2017 "Fast radio bursts: mysterious flashes from cosmological distances", Cosmology Seminar, Simon Fraser University, Burnaby, Apr. 2017.

2017 "Mapping the Universe with digital radio telescopes", Astronomy & Physics Seminar, Saint Mary's University, Halifax, Mar. 2017.

2017 "Understanding the early Universe using scalable 21 cm surveys", Astronomy Seminar, Carnegie Mellon University, Pittsburgh, Mar. 2017.

2017 "Tidal imprints in the large-scale structure with 21 cm surveys", Seminar, Canadian Institute for Theoretical Astrophysics, Toronto, Mar. 2017.

2017 "Fast radio bursts: a mysterious new class of astronomical object", Physics and Astronomy Colloquium, University of British Columbia, Vancouver, Jan. 2017.

2016 "The environment of a fast radio burst source and outlook for CHIME–FRB", Astronomy Tea Talk, California Institute of Technology, Pasadena, Nov. 2016.

2016 "Fast radio bursts as probes of cosmic structure", Seminar, Perimeter Institute for Theoretical Physics, Waterloo, Jan. 2016.

2015 "Fast radio bursts as probes of structure in 3D", Dark Universe Science Center Seminar, University of Washington, Seattle, Oct. 2015.

2014 "Large-scale structure with CHIME", Seminar, Academia Sinica Institute of Astronomy and Astrophysics, Taipei, Oct. 2014.

2012 "Pioneering 21 cm intensity mapping at the Green Bank Telescope", Cosmology Seminar, University of California, Berkeley, Oct. 2012.

2012 "21 cm intensity mapping—large scale structure with the Green Bank Telescope", Seminar, Australia Telescope National Facility Headquarters, Sydney, Apr. 2012.

2012 "21 cm intensity mapping—large scale structure with the Green Bank Telescope", Astrophysics Seminar, University of Melbourne, Mar. 2012.

Conferences

2017 "Large-scale structure of the Universe in the age of digital telescopes", Plenary Talk, Annual Meeting of the Americal Physical Society Northwest Section, Forest Grove, June 2017.

2017 "How to test parity symmetry in primordial gravity waves", Canadian Institute for Advanced Research, Program in Cosmology and Gravity, annual meeting, Lake Louise, Mar. 2017.

2016 "Dense magnetized plasma associated with a fast radio burst", Canadian Institute for Advanced Research, Program in Cosmology and Gravity, annual meeting, Whistler, Mar. 2016.

2015 "Clustering of fast radio bursts in dispersion measure space", Canadian Institute for Advanced Research, Program in Cosmology and Gravity, annual meeting, Banff, Mar. 2015.

2014 "CHIME: calibration and pipeline", Canadian Institute for Advanced Research, Program in Cosmology and Gravity, annual meeting, Quebec City, May 2014.

2013 "21 cm intensity mapping with the Green Bank Telescope: interpretation and prospects", Innovative Techniques in 21cm Analysis, Columbus, Apr. 2013.

2010 "Gravity wave fossils—signatures of tensor modes in pre-reionization 21 cm structure", CITA25/Bond60, Toronto, May 2010.

Outreach and Press

Articles

2017 "Research brief: A repeating fast radio burst", Canadian Institute for Advanced Research—Ideas Exchange (2017).

Public Lectures

2017 "Searching for extragalactic radio flashes with digital telescopes", TRIUMF Saturday Morning Lecture, Simon Fraser University, Burnaby, Dec. 2017.

2017 "Fast radio bursts *probably* aren't powering alien space ships", Cosmic Nights: Science of Science Fiction Lecture, H.R. MacMillan Space Centre, Vancouver, Nov. 2017.

2017 "Searching for extragalactic radio flashes with digital telescopes", TRIUMF Saturday Morning Lecture, TRIUMF, Vancouver, Sept. 2017.

2016 "Fast radio bursts—Flashes from outside the galaxy", Monthly Meeting, Royal Astronomical Society of Canada—Vancouver Centre, Vancouver, Apr. 2016.

Events

2017 University of British Columbia Eclipse Event, Volunteer, University of British Columbia, Department of Physics and Astronomy, Aug. 2017

2016 Salal Preschool Departmental Visit, Organizer, University of British Columbia, Department of Physics and Astronomy, Aug. 2016

2009 Science Rendezvous, Volunteer, University of Toronto, May 2009

CHIME First Light Coverage

2017 I. Semeniuk, "Listening for the universe to chime in", The Globe and Mail (2017).

2017 N. Mortillaro, "Canada's largest radio telescope unveiled in British Columbia", Canadian Broadcasting Corporation News (2017).

2017 J. Dubé, "This Huge Telescope is Built Like A Halfpipe and Hunts for Dark Energy", Vice Motherboard (2017).

FRB 110523 Coverage

2016 S. Hall, "The Mystery of Fast Radio Bursts", Sky & Telescope **132**, 24 (2016).

2015 E. Gibney, "Mysterious radiowave blast may have come from starquake", Nature (2015) 10.1038/nature.2015.18935.

2015 N. Drake, "Those Blasts of Radio Waves from Deep Space? Not Aliens", Phenomena, National Geographic (2015).

2015 L. Billings, "Fast Radio Bursts Mystify Experts—for Now", Scientific American (2015).

2015 "'Fast Radio Burst' Sheds New Light on Origin of These Extreme Events", National Radio Astronomy Observatory, press release (2015).

Dispersion Space Coverage

2015 D. Lindley, "Focus: Radio Signals May Reveal Cosmological Structure", Phyiscs **8**, 90 (2015).

2015 "Researchers propose new way to chart the cosmos in 3D", University of British Columbia, press release (2015).

2015 "The Flash Measure", Radio New Zealand National—Nights (2015).

References

Ue-Li Pen, University of Toronto, pen@cita.utoronto.ca

Gary Hinshaw, University of British Columbia, hinshaw@phas.ubc.ca

Jeffrey Peterson, Carnegie Mellon University, jbp@cmu.edu

Victoria Kaspi, McGill University, vkaspi@physics.mcgill.ca