

Curriculum Vitae

Yanbei Chen

California Institute of Technology
Theoretical Astrophysics 130-33
Pasadena, California 91125
USA

Phone: +1 626 395 4258
Email: yanbei@caltech.edu

Personal information

- **Date and place of birth:** July 25, 1977; Beijing, China.
- **Citizenship:** P.R.China
- **Family Status:** Married, 1 Child.

Current Employment

- Assistant Professor of Physics, California Institute of Technology, Pasadena, California, USA

Previous Employment

- September 2004 – December 2008, Staff Scientist (Wissenschaftlicher Mitarbeiter), Max Planck Institute for Gravitational Physics, Golm, Germany.
- January 2005 – December 2008, Leader of research group sponsored by the Alexander von Humboldt Foundation's *Sofja Kovalevskaja Award* (funded by the German Federal Ministry of Education and Research).
- July 2003 – September 2004, Postdoctoral Scholar, California Institute of Technology, Pasadena, CA, USA.
Supervisor: Prof. Kip S. Thorne

Education

- **Ph.D.**, California Institute of Technology, Pasadena, CA, USA, June, 2003.
Thesis: *Topics of LIGO Physics: Quantum Noise in Advanced Interferometers and Template Banks for Compact-Binary Inspirals.*
Supervisor: Prof. Kip S. Thorne
- **B.S.**, Peking University, Beijing, China, June, 1999.
Thesis: *Elastic e - d scattering and the ρ - π - γ process.*
Supervisor: Prof. Tan-sheng Cheng

Current Research Interests

- All aspects of gravitational-wave science: fundamental theory, astrophysical phenomenology, source analyses and simulations, experimental design, experimental execution, and data analysis.

Current Research Topics

- Gravitational-wave detectors:
 - Quantum-measurement theory and its application to advanced interferometric gravitational-wave detectors; using gravitational-wave detectors to test quantum mechanics of macroscopic objects.
 - The design, modeling, and optimization of advanced gravitational-wave interferometers; designing lab-scale prototypes to verify key technologies underlying future interferometers.
 - Conceptual designs of novel gravitational-wave detectors.
- Physics of gravitational-wave sources and gravitational-wave data analysis:
 - Post-Newtonian gravitational waveforms from compact-binary objects; data analysis strategies for detecting binary inspirals with initial LIGO/GEO interferometers.
 - Mapping space-time geometry with gravitational waveforms from compact-binary objects
 - Understanding non-linear gravitational interaction by applying analytic tools to results of numerical relativity simulations.

List of Publications in Gravitational-Wave Science

- 1 A. Buonanno and Y. Chen, *Optical noise correlations and beating the Standard Quantum Limit in advanced gravitational-wave detectors*, *Class. Quantum Grav.* **18**, L95 (2001).
- 2 A. Buonanno and Y. Chen, *Quantum noise in second generation, signal-recycled laser interferometric gravitational-wave detectors*, *Phys. Rev. D* **64**,042006 (2001).
- 3 A. Buonanno and Y. Chen, *Signal recycled laser-interferometer gravitational-wave detectors as optical springs*, *Phys. Rev. D* **65**, 042001 (2001).
- 4 A. Buonanno and Y. Chen, *Laser-interferometer gravitational-wave optical-spring detectors*, the Proceedings of 4th Edoardo Amaldi Conference on Gravitational Waves, *Class. Quantum Grav.* **19**, 1569 (2002).
- 5 P. Purdue and Y. Chen, *Practical speed-meter designs for QND gravitational-wave interferometers*, *Phys. Rev. D* **66**, 122004 (2002)
- 6 A. Buonanno, Y. Chen and M. Vallisneri, *Detection template families for gravitational waves from the final stages of binary-black-hole inspirals. Non-spinning case*, *Phys. Rev. D* **67**, 024016 (2003).
- 7 A. Buonanno and Y. Chen, *Scaling law in signal-recycled laser-interferometer gravitational-wave detectors*, *Phys. Rev. D* **67**, 062002 (2003).
- 8 Y. Chen, *Sagnac interferometer as a speed-meter-type, Quantum-Nondemolition gravitational-wave detector*, *Phys. Rev. D* **67**, 122004 (2003).
- 9 A. Buonanno, Y. Chen and M. Vallisneri, *Detecting gravitational waves from precessing binaries of spinning compact objects: Adiabatic limit*, *Phys. Rev. D* **67**, 122005 (2003).
- 10 A. Buonanno, Y. Chen and N. Mavalvala, *Quantum noise in laser-interferometer gravitational-wave detectors with modulation-demodulation readout scheme*, *Phys. Rev. D* **67**, 122005 (2003).
- 11 J. Harms, Y. Chen, S. Chelkowski, A. Franzen, H. Vahlbruch, K. Danzmann and R. Schnabel, *Squeezed-input, optical-spring, signal-recycled gravitational-wave detectors*, *Phys. Rev. D* **68**, 042001 (2003).
- 12 G. de Vine, M. Gray, D. McClelland, Y. Chen and S. Whitcomb, *Measurement of the frequency response of a bench-top quantum speed meter interferometer*, *Phys. Lett. A* **316**, 17 (2003).
- 13 Y. Pan, A. Buonanno, Y. Chen and M. Vallisneri, *A physical template family for gravitational waves from precessing binaries of spinning compact objects: Application to single-spin binaries*, *Phys. Rev. D* **69**, 104017 (2004).

- 14 A. Buonanno and Y. Chen, *Improving the sensitivity to gravitational-wave sources by modifying the input-output optics of advanced interferometers*, Phys. Rev. D **69**, 102004 (2004).
- 15 A. Buonanno, Y. Chen, Y. Pan and M. Vallisneri, *Quasiphysical family of gravity-wave templates for precessing binaries of spinning compact objects: Application to double-spin precessing binaries*, Phys. Rev. D **70**, 104003 (2004).
- 16 S. Kawamura and Y. Chen, *Displacement-noise-free gravitational-wave detection*, Phys. Rev. Lett., **93**, 211103 (2004).
- 17 S. Wise, V. Quetschke, A.J. Deshpande, G. Mueller, D.H. Reitze, D.B. Tanner, B.F. Whiting, Y. Chen, A. Tunnermann, E. Kley, and T. Clausnitzer, *Phase Effects in the Diffraction of Light: Beyond the Grating Equation*, Phys. Rev. Lett., **95**, 013901 (2005)
- 18 T. Corbitt, Y. Chen and N. Mavalvala, *Mathematical framework for simulation of quantum fields in complex interferometers using the two-photon formalism*, Phys. Rev. A **72**, 013818 (2005).
- 19 A. Buonanno, Y. Chen, Y. Pan, H. Tagoshi, M. Vallisneri, *Detecting gravitational waves from precessing binaries of spinning compact objects. II. Search implementation for low-mass binaries*, Phys. Rev. D **72**, 084027 (2005).
- 20 T. Corbitt, Y. Chen, F. Khalili, D. Ottaway, S. Vyatchanin, S. Whitcomb and N. Mavalvala, *A squeezed state source using radiation pressure induced rigidity*, Phys. Rev. A **73**, 023801 (2006).
- 21 Y. Chen and S. Kawamura, *Displacement- and timing-noise-free gravitational-wave detection*, Phys. Rev. Lett. **96**, 231102 (2006).
- 22 K. Somiya, Y. Chen, S. Kawamura and N. Mio, *Frequency noise and intensity noise of next-generation gravitational-wave detectors with RF/DC readout schemes*, Phys. Rev. D **73**, 122005 (2006).
- 23 A. Buonanno, Y. Chen, T. Damour, *Transition from inspiral to plunge in precessing binaries of spinning black holes*, Phys. Rev. D **74**, 104005 (2006).
- 24 Y. Chen, A. Pai, K. Somiya, S. Kawamura, S. Sato, K. Kokeyama, R.L. Ward, K. Goda and E.E. Mikhailov, *Interferometers for displacement-noise-free gravitational-wave detection*, Phys. Rev. Lett. **97**, 151103 (2006).
- 25 S. Sato, S. Kawamura, K. Kokeyama, R.L. Ward, Y. Chen, A. Pai, K. Somiya, *Demonstration of displacement- and frequency-noise free laser interferometry using bi-directional Mach-Zehnder interferometers*, Phys. Rev. Lett. **98**, 141101 (2007).
- 26 T. Corbitt, Y. Chen, H. Mueller-Ebhardt, E. Innerhofer, D. Ottaway, H. Rehbein, D. Sigg, S. Whitcomb, C. Wipf and N. Mavalvala, *An All-Optical Trap for a Gram-Scale Mirror*, Phys. Rev. Lett. **98**, 150802 (2007).
- 27 H. Rehbein, H. Mueller-Ebhardt, K. Somiya, C. Li, R. Schnabel, K. Danzmann and Y. Chen, *Local readout enhancement for detuned signal-recycling interferometers*, Phys. Rev. D **76**, 062002 (2007).
- 28 K. Somiya, Y. Chen, K. Goda and E.E. Mikhailov, *Utility investigation of artificial time delay in displacement-noise-free interferometers*, Phys. Rev. D **76** 022002 (2007).
- 29 H. Mueller-Ebhardt, H. Rehbein, R. Schnabel, K. Danzmann and Y. Chen, *Entanglement of macroscopic test masses and the Standard Quantum Limit in laser interferometry*, Phys. Rev. Lett. **100**, 013601 (2008)
- 30 P. Ajith, S. Babak, Y. Chen et al., *Template bank for gravitational waveforms from coalescing binary black holes: Nonspinning binaries*, Phys. Rev. D **77**, 104017 (2008).
- 31 H. Rehbein, H. Müller-Ebhardt, K. Somiya, S.L. Danilishin, R. Schnabel, K. Danzmann and Y. Chen, *Double optical spring enhancement for gravitational-wave detectors*, Phys. Rev. D **78**, 062003 (2008).
- 32 M. Bondarescu, O. Kogan and Y. Chen, *Optimal light beams and mirror shapes for future LIGO interferometers*, Phys. Rev. D **78**, 082002 (2008).
- 33 C. Wipf, T. Corbitt, Y. Chen and N. Mavalvala, *Route to observing ponderomotive entanglement with optically trapped mirrors*, New J. Phys. **10** 095017 (2008).

Select Papers of the LIGO Scientific Collaboration

- 34 LIGO Scientific Collaboration, B. Abbott et al., *Detector Description and Performance for the First Coincidence Observations between LIGO and GEO*, Nucl. Inst. and Meth. in Phys. Res. A **517**, 154 (2004).
- 35 LIGO Scientific Collaboration, B. Abbott et al., *First upper limits from LIGO on gravitational wave bursts*, Phys. Rev. D **69**, 102001 (2004).
- 36 LIGO Scientific Collaboration, B. Abbott et al., *Analysis of LIGO data for gravitational waves from binary neutron stars*, Phys. Rev. D **69**, 122001 (2004).
- 37 LIGO Scientific Collaboration, B. Abbott et al., *Setting upper limits on the strength of periodic gravitational waves from PSR J1939+2134 using the first science data from the GEO600 and LIGO detectors*, Phys. Rev. D **69**, 082004 (2004).
- 38 LIGO Scientific Collaboration, B. Abbott et al., *Analysis of first LIGO science data for stochastic gravitational waves*, Phys. Rev. D **69**, 122004 (2004).
- 39 LIGO Scientific Collaboration, B. Abbott et al., *A Search for Gravitational Waves Associated with the Gamma Ray Burst GRB030329 Using the LIGO Detectors*, Phys. Rev. D **72** 042002 (2005).
- 40 LIGO Scientific Collaboration, B. Abbott et al., *Upper limits on gravitational wave bursts in LIGO's second science run*, Phys. Rev. D **72** 062001 (2005).
- 41 LIGO Scientific Collaboration, B. Abbott et al., *Upper limits from LIGO and TAMA detectors on the rate of gravitational wave bursts*, Phys. Rev. D **72** 122004 (2005).
- 42 LIGO Scientific Collaboration, B. Abbott et al., *Search for gravitational waves from galactic and extra-galactic binary neutron stars*, Phys. Rev. D **72** 082001 (2005).
- 43 LIGO Scientific Collaboration, B. Abbott et al., *Search for gravitational waves from primordial black hole binary coalescences in the galactic halo*, Phys. Rev. D **72** 082002 (2005).
- 44 LIGO Scientific Collaboration, B. Abbott et al., *First all-sky upper limits from LIGO on the strength of periodic gravitational waves using the Hough transform*, Phys. Rev. D **72**, 102004 (2005).
- 45 The LIGO Scientific Collaboration: B. Abbott, et al, M. Kramer, A.G. Lyne, *Limits on gravitational wave emission from selected pulsars using LIGO data*, Phys. Rev. Lett. **94** 181103 (2005).
- 46 The LIGO Scientific Collaboration: B. Abbott, et al, *Upper limits on a stochastic background of gravitational waves*, Phys. Rev. Lett. **95** 221101 (2005).
- 47 The LIGO Scientific Collaboration: B. Abbott, et al, *Upper limits on a stochastic background of gravitational waves*, Phys. Rev. Lett. **95** 221101 (2005).
- 48 LIGO Scientific Collaboration, B. Abbott et al., *Search for gravitational waves from binary black hole inspirals in LIGO data*, Phys. Rev. D **73**, 062001 (2006).
- 49 LIGO Scientific Collaboration, B. Abbott et al., *Joint LIGO and TAMA300 search for gravitational waves from inspiralling neutron star binaries*, Phys. Rev. D **73**, 102002 (2006).
- 50 The LIGO Scientific Collaboration: B. Abbott, et al, *Search for gravitational-wave bursts in LIGO's third science run*, Class. Quant. Grav. **23** S29-S39 (2006).
- 51 The LIGO Scientific Collaboration: B. Abbott, et al, *Coherent searches for periodic gravitational waves from unknown isolated sources and Scorpius X-1: results from the second LIGO science run*, Phys. Rev. D **76** 082001 (2007).
- 52 The LIGO Scientific Collaboration: B. Abbott, et al, *Search for gravitational-wave bursts in LIGO data from the fourth science run*, Class. Quantum Grav. **24** 5343-5369 (2007).
- 53 The LIGO Scientific Collaboration: B. Abbott, et al, M. Kramer, A.G. Lyne, *Upper Limits on Gravitational Wave Emission from 78 Radio Pulsars*, Phys. Rev. D **76** 042001 (2007).

- 54 The LIGO Scientific Collaboration and M. Kramer and A.G. Lyne, Upper Limits on Gravitational Wave Emission from 78 Radio Pulsars, *Phys. Rev. D* **76** 042001 (2007).
- 55 The LIGO Scientific Collaboration: B. Abbott, et al, *Searching for Stochastic Background of Gravitational Waves with LIGO*, *Astrophys. J.* **659**, 918 (2007).
- 56 The LIGO Scientific Collaboration: B. Abbott, et al, *Upper limit map of a background of gravitational waves*, *Phys. Rev. D* **76** 082003 (2007).
- 57 The LIGO Scientific Collaboration: B. Abbott, et al, *First Cross-Correlation Analysis of Interferometric and Resonant-Bar Gravitational-Wave Data for Stochastic Backgrounds*, *Phys. Rev. D* **76** 022001 (2007).
- 58 The LIGO Scientific Collaboration: B. Abbott, et al, *Upper limit map of a background of gravitational waves*, *Phys. Rev. D* **76** 082003 (2007).
- 59 LIGO and ALLEGRO Collaborations, *First Cross-Correlation Analysis of Interferometric and Resonant-Bar Gravitational-Wave Data for Stochastic Backgrounds*, *Phys. Rev. D* **76** 022001 (2007).
- 60 L Baggio et al. (LIGO and AURIGA Collaborations), *A joint search for gravitational wave bursts with AURIGA and LIGO*, *Class. Quantum Grav.* **25** 095004 (2008).
- 61 The LIGO Scientific Collaboration: B. Abbott, et al, *Search of S3 LIGO data for gravitational wave signals from spinning black hole and neutron star binary inspirals*, *Phys. Rev. D* **78** 042002 (2008).
- 62 The LIGO Scientific Collaboration: B. Abbott, et al, *Search for Gravitational Waves Associated with 39 Gamma-Ray Bursts Using data from the Second, Third, and Fourth LIGO Runs*, *Phys. Rev. D* **77** 062004 (2008).
- 63 The LIGO Scientific Collaboration: B. Abbott, et al, *First joint search for gravitational-wave bursts in LIGO and GEO600 data*, *Class. Quantum Grav.* **25** 245008 (2008).
- 64 The LIGO Scientific Collaboration and K.C. Hurley, *Implications for the Origin of GRB 070201 from LIGO Observations*, *Astrophys. J.* **681** 1419 (2008).
- 65 The LIGO Scientific Collaboration, *Beating the spin-down limit on gravitational wave emission from the Crab pulsar*, *Astrophys. J. Lett.* **683** 45 (2008).
- 66 The LIGO Scientific Collaboration and S. Barthelmy, N. Gehrels, K.C. Hurley and D. Palmer, *Search for Gravitational Wave Bursts from Soft Gamma Repeaters*, *Phys. Rev. Lett.* **101** 211102 (2008).

Web-based Course on Gravitational-Wave Science

- 67 K.S. Thorne, M. Bondarescu and Y. Chen, *Gravitational Waves: a Web-Based Course*: all materials (including lecture videos) available at <http://elmer.tapir.caltech.edu/ph237/>.

Publications in Other Fields

- 68 T. Ye, Y. Chen and T. S. Cheng, *Tensor polarization $T(20)$ of the deuteron and the ρ - π - γ process*, *Commun. Theor. Phys.* **35**, 455 (2001).