

KGWG Activities

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Topics

- Summary of Progress and Prospects
- Personnel
- LSC Activities
- Meetings
- GW Related Research
- Funding Efforts

2013 Progress and Prospect

- First PhD on LIGO data analysis in 2013 Feb. (H. S. Cho on Parameter estimation based on Fisher Matrix, his talk today)
- two more PhDs expected in 2014 (Y. M. Kim and K. M. Kim)
- Another PhD on GW sources in Galactic Nuclei, Final exam next week@SNU (J. S. Hong)
- First 'First author' Paper Published (again H. S. Cho)
- Other 'First author' papers in progress (K. M. Kim, Chunglee Kim)
- First Master: next week on optical followup (SNU)
- LDG Upgrade to Tier 3 expected
- Two undergraduates from US through IREU Program, June-July 2013
- Funding efforts are not successful yet. New strategy needed?

Personnel

- LSC
 - 19 members (6 faculty, 4 staffs, 3 pdf, 4 graduates, 2 undergraduates)
- Non-LSC
 - K. Cho, T. Yoon, H.W. Lee, J.W. Kim, (S.P. Kim)+a few students

LSC Activities: 1/3

- Short GRB Search
 - Development of alternate search schemes using artificial neural network (ANN) with genetic algorithm (GA) or GA-optimized Decision Tree (DT) schemes
- **Kyung Min Kim's talk**
- CBC Parameter Estimation with Waveforms Involving Amplitude Corrections
 - Study of the the effects of amplitude corrections with the SpinTaylorT4 waveform For non-spinning CBC signals generated by SpinTaylorT4 with amplitude corrections, a few of the geometrical parameters are measurable for strong signals(SNR 20)
- **Chunglee Kim's talk**
- Investigation of the viability of FPGA deployment for LIGO gravitational wave data analysis. NIMS (One of KGWG's member institutions) has been developing hybrid computing platform using FPGAs and CPUs and considers LIGO gravitational wave search to be one of its target applications.

No talk this meeting

LSC Activities: 2/3

- Auxiliary Channel Multivariate Classifier (AUX MVC):
 - Development of multivariate classifying pipeline which will utilize auxiliary channels to classify glitches
Young Min Kim's Talk
 - Development of a genetic algorithm (GA)-based artificial neural network (ANN) classifier for auxiliary channels that provides a feedback to instrumentalists during commissioning of the aLIGO and the control room software that monitors the behavior of the aLIGO
- Computing Hardware and Support (next page)

LSC Activities: 3/3

- Computing and Hardware Support
 - KISTI
 - 300 dedicated cores, 168 TB storage
 - Currently Tier 4 LDG, but soon to be upgraded to Tier 3
 - Technical Personnel support (1.0 FTE)
 - Data hosting
 - VSR 1-4 h(t) transfer complete (5.6 TB)
 - LIGO S5 and S6 transfer in progress (~100 TB)
 - NIMS
 - Additional cluster (shared basis)
 - Technical Personnel support (0.3 FTE)

Meetings

- The 3rd Japan-Korea Meeting on KAGRA
 - December 21-22, 2012, Sogang University
- Gravitational Waves: New Frontiers, January 16-18, 2013@SNU
 - An international meeting sponsored by Korean Academy of Science and Technology (KAST)
 - First major meeting on Gravitational Waves
 - Talks covered all major projects: LIGO, Virgo, KAGRA, GEO-600, NGO, PTA....
- (Future) Beijing GW Workshop
 - July 1-2, 2013
 - 11 talks (4 are KGWG members, 1 on KAGRA)
- (Future) GWPAW-2013, Pune, India
 - Dec. 17-21, 2013
 - Program in progress: strong emphasis on EM followup!

International School on NR and GW

- Venue: APCTP Headquarter in Postech
- August 3-10, 2013
- Sponsored by APCTP and JSPS Program with additional supports from various sources
- Outline
 - Aug. 3-5: Laboratory courses on Gravitational wave data analysis for binary inspiral search and General relativistic hydrodynamics (* Two sessions go in parallel.): Lectures and Hands-on labs.
 - Aug. 6: Presentations of projects in labs, Free discussion, small group meetings, excursions, etc.
 - Aug. 7th: Mini-Workshop: Presentation by students on their research works
 - Aug. 8-10: Lectures (see next page)

NR+GW School: Talks

- Aug. 8-10: Talks on NR and GW (Thanks to KAGRA Colleagues!)
 - Y. Michimura: Alignment Sensing and Control for KAGRA laser interferometer
 - A. Shoda: A New Detector for Low-Frequency Gravitational Waves: Torsion-bar Antenna
 - Y. Sakakibara: KAGRA Cryogenics
 - S. Ueda: The beam shutter experiment for KAGRA
 - Y. Susa: Review of The SQL in Gravitational Wave Detection
 - K. Oohara: Astrophysics with Gravitational Waves
 - K. Kuroda: Detection physics & technology of gravitational waves in KAGRA
 - H. Tagohsi: Fundamentals of gravitational wave data analysis
 - K. Hayama: Fundamentals of gravitational wave data analysis

Progress in KAGRA Collaboration

- Not much progress since last meeting
- Human Resources
 - Senior people are pre-occupied by their on-going projects, and getting engaged in KAGRA related experiments will need further funding.
 - GW school will help in attracting young students
 - So far we are able to support 2 postdocs, and a few graduate students
 - We should continue to identify the area/items/extent of the collaboration
- Area of collaboration
 - We have on-going discussions, and collaboration in data analysis
 - H.W. Lee's group: parameter estimation
 - NIMS group: detector characterization
 - Experimental collaboration needs more tuning, etc.

GW Related Researches in Korea

- Numerical Relativity Group (led by G.W. Kang)
 - Development of NR Hydro code and application
 - Neutron star equation of state
 - Modes of neutron stars excited by the glitches
 - Simulations of binary mergers with the effects of GW emission
- Stellar Dynamics Group (led by H. M. Lee)
 - NS, BH binaries in star clusters
 - BH binaries from galactic nuclei
- Pulsar population studies (Chunglee Kim)
- Neutron stars + Binary evolution (Changwhan Lee, **talk on Tuesday**)

Other Works

- Please refer to the following talks:
 - Kyuman Cho: Precision tilt and radius of curvature sensor using double-pass AOM
 - Sang-Pyo Kim: Gravitational Wave-Matter Interactions and Quantum Measurement
 - Hyung Won Lee: Stochastic gravitational wave and its spectral property
- Also, High-Power laser by Tai-Hyun Yoon. He will visit ICRR later this summer for collaboration

Some Highlights

- GW Emission after Pulsar Glitches (manuscript being refined)
 - The strongest modes for GW emission are 2p_1 and H_1 rather than 2f .
 - Strong constraints for the NS equation of state
 - Amplitude is lower than aLIGO/aVirgo limits for 10 kpc sources.
- NS and BH binaries in star clusters (manuscript in near completion)
 - NS binaries are negligible compared to disk populations
 - BH binaries are very abundant, and annual detection rate could be 15 yr^{-1} for aLIGO/aVirgo. KAGRA rate could be larger
- BH binaries from galactic nuclei (PhD thesis, paper soon to be prepared)
 - First realistic simulations with N-body
 - Still some limitations, but rate of BH binaries could be smaller than O'Leary et al. ($O(1) \text{ /yr}$ for aLIGO/aVirgo)

Funding Efforts

- Proposal for the Institute for Basic Science (IBS) submitted in Jan.
 - Not selected in the selection window of Feb. - May.
 - Does not mean that it is completely out, but we are facing some criticism that PI has no experience in experiment
 - Better strategy and argument have to be developed
- Other possible funding channels
 - Science Research Center - University level research group funded by National Science Foundation (NRF)
 - Needs a combined group from universities
 - Hosting university?

Experimental Items in IBS Proposal

- Experimental Studies
 - Precision Tests of Gravitational Laws using Torsion Pendulum and Low Temperature Techniques
 - Development of ultra-stable High-Power Laser with <1 Hz Line-Widths (related to KAGRA)
 - Squeezed Light Source
 - Fundamental Studies of Quantum limited detectors
 - Balanced Heterodyne Interferometer Scheme
 - Frequency Comb based technology
- Astrophysical Studies
 - Detection of lights from first stars in near IR (in collaboration with Korean satellite and SPICA)
 - Growth of Black Holes in the universe: Reverberation mapping of AGN's at large z

Prospects

- Data analysis works in LSC framework are going well. We are planning to play more active roles.
- One example: participation in engineering runs of aLIGO
- We are looking for further resources for the experimental group:
 - Necessary for the upgrade of KAGRA collaboration
 - So far unsuccessful: disappointing, but let's hope for some breakthrough in the near future!
- We will continue to attract talented young people and apply for funds