catalogues is necessary to optimize the future analysis of data. I will present the mock neutral hydrogen catalogues that we are developing, using the Horizon run 4 simulations, to cross-correlate with mock galaxy catalogues from low redshift surveys and I will show the preliminary results from the first mock catalogues.

[구 CD-06] Simulating the Lyman-Alpha Forest with Massive Neutrinos and Dark Radiation for Large-Volume Surveys

Graziano Rossi
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In support of current and upcoming large-volume cosmological surveys such as the SDSS-IV eBOSS, LSST, and DESI, we present an extensive suite of high-resolution cosmological hydrodynamical simulations spanning a large range of cosmological and astrophysical parameters. We follow the evolution of gas, dark matter, neutrinos, and dark radiation, and consider several combinations of box sizes and number of particles - enhancing the resolution up to 3 x 33283 = 110 billion particles in a (100 h−1 Mpc)3 box size. We also provide 100,000 skewers for a variety of redshift slices and combination of cosmological and astrophysical parameters, useful for interpreting upcoming high-quality Lyman-α forest data. These novel simulations represent an improvement over our previous runs, and can be useful for a broader variety of cosmological and astrophysical applications, ranging from the three-dimensional modeling of the Lyman-α forest to cross-correlations between different probes, for studying the expansion history of the Universe including massive neutrinos, and for particle-physics related topics.

천문우주관측기술

[구 AT-01] Infrared Spectro-Photomeric Survey Missions: NISS & SPHEREx

Woong-Seob Jeong[1,2], Yujin Yang[1,2], Sung-Joon Park[1], Jeonghyun Pyo[1], Minjin Kim[3], Bongkon Moon[1], Dae-Hee Lee[1], Won-Kee Park[1], Young-Sik Park[1], Youngsoo Jo[1], Il-Joong Kim[1], Jongwan Ko[1,2], Hyun Jong Seo[1], Kyeongyeon Ko[1,2], Seongjae Kim[1,2], Hoseong Hwang[1], Yong-Seon Song[1], Jeong-Eun Lee[4], Myungshin Im[5], Toshio Matsumoto[1], NISS Team[1,2,3,6,7], SPHEREx Korean Consorthium[1,2,3,4,5,6,8]
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The NISS (Near-infrared Imaging Spectrometer for Star formation history) onboard NEXTSat-1 was successfully launched on last December and is now under the operation phase. The capability of both imaging and spectroscopy is a unique function of the NISS. It has realized the imaging spectroscopy (R~20) with a wide field of view of 2 x 2 deg. in a wide near-infrared range from 0.95 to 2.5μm. The major scientific mission is to study the cosmic star formation history in the local and distant universe. It also demonstrated the space technologies related to the infrared spectro-photometry in space. The NISS is performing the imaging spectroscopic survey for local star-forming galaxies, clusters of galaxies, star-forming regions, ecliptic deep fields and so on.

As an extension of the NISS, the SPEHREx (Spectro-Photometer for the History of the Universe Epoch of Reionization, and Ices Explorer) was selected as the NASA MIDEX (Medium-class Explorer) mission (PI Institute: Caltech). As an international partner, KASI will participate in the development and the science for SPHEREx. It will perform the first all-sky infrared spectro-photometric survey to probe the origin of our Universe, to explore the origin and evolution of galaxies, and to explore whether planets around other stars could harbor life. Compared to the NISS, the SPHEREx is designed to have a much wider FoV of 3.5 x 11.3 deg. as well as wider spectral range from 0.75 to 5.0μm. Here, we introduce the status of the two space missions.

[구 AT-02] Possible framework for East Asia Observatory (EAO) and Subaru partnership

Myungshin Im
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Recently, there have been discussions among national observatories in East Asia about the possibility of EAO and the Subaru observatory forming a partnership. The official EAO-Subaru partnership can make the powerful wide-field observation capabilities of Subaru available to Korean astronomers through EAO, and also can serve as an excellent platform to gather astronomers in East Asia together for flourishing regional collaboration activities. A working group

has been formed to outline the framework of the EAO-Subaru partnership, and the working group report has been prepared. In this talk, I will explain the proposed partnership framework in the working group report. Inputs are very welcome from KAS members about the proposed framework.

[구 AT-03] Populations Accessible to Gravitational Wave and Multi-Messenger Astronomy Within 10 Years

Chunglee Kim
Ewha Womans University

Gravitational-wave (GW) sources for the next decades would be in majority binaries consisting of neutron stars and/or black holes reside in the extragalactic environment. For example, GW170817 was the first extragalactic neutron star - neutron star binary found by GW observations and it was proved the power of multi-messenger astronomy (MMA) including the KMTNet observations. With the ever increased sensitivity, the 3rd observation run (O3) led by the advanced LIGO and advanced Virgo this year aims to search for more 'standard' populations as well as 'exotic' ones expected by stellar evolution. I will present highlights of on-going efforts by researchers in Korea and those in abroad for estimating physical parameters of a source. Mass, spin, distance, and location are prerequisite information to constrain theoretical understanding of the source formation and evolution. Furthermore, these information are to be shared with the international community for follow-up multi-messenger observations. I will present the observational accuracy expected for the future GW observations and discuss their implications. If time allows, I will make a few remarks on prospects of O3 with KAGRA collaborations, which many domestic researchers are closely involved in.

[구 AT-04] Observing strategy for electromagnetic counterpart of gravitational wave source

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Recent observation of the neutron star merger event, GW170817, through both gravitational wave (GW) and electromagnetic wave (EM) observations opened a new way of exploring the universe, namely, multi-messenger astronomy (MMA). One of the keys to the success of MMA is a rapid identification of EM counterpart through optical/NIR observations.

We will present the strategy for prioritization of GW source host galaxy candidates to be observed with narrow-field optical telescopes. Our method relies on recent simulation results regarding plausible properties of GW source host galaxies and the low latency localization map from LIGO/Virgo. We will show the test results for both NS merger and BH merger events using previous events and possible future events and describe observing strategy with our facilities for GW events during the ongoing LIGO/Virgo O3 run.

[구 AT-05] Sirius: The KASI-SNU Optical Intensity Interferometer

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Optical intensity interferometry, developed in the 1950s, is a simple and inexpensive method for achieving angular resolutions on microarcsecond scales. Its low sensitivity has limited intensity interferometric observations to bright stars so far. Substantial improvements are possible by using avalanche photodiodes (APDs) as light detectors. We present here the results of laboratory measurements with a prototype astronomical intensity interferometer using APDs in continuous ("linear") detection mode - arguably, the first of its kind. We used two interferometer configurations, one with zero baseline and one with variable baseline. Using a superluminous diode as light source, we unambiguously detected Hanbury Brown-Twiss photon-photon correlations at very high significance. From measuring the correlation as function of baseline, we measured the angular diameter of the light source, in analogy to the measurement of the angular diameter of a star. Our results demonstrate the possibility to construct large astronomical intensity interferometers that can address a multitude of astrophysical science cases.

[구 AT-06] PSF Deconvolution on the Integral Field Unit Spectroscopy Data

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