381.02 — Assessing the Readiness of Numerical Relativity for Future Gravitational Wave Detections

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LIGO and Virgo have been consistently detecting compact binary coalescences, providing us with incredibly valuable information about gravity in the strong-field regime. However, their limited sensitivity makes it challenging to constrain the parameters of the merging system. Future space-based and third-generation ground-based detectors will increase that sensitivity significantly, allowing us to observe systems with much larger signal-to-noise ratios. While this gives us an incredible opportunity to studying compact coalescences, it also presents challenges. For all detectors, both current and future, numerical relativity (NR) simulations are crucial for the detection and interpretation of gravitational wave signals. However, NR still has significant uncertainty associated with a variety of causes. One of these is the limited spatial and temporal resolution inevitable with any simulation. This finite resolution means that the waveforms produced are not ground truth, i.e. higher resolution simulations appear different than lower resolution simulations, implying infinite resolution would be needed to construct a perfect waveform. While the current resolution simulations are indistinguishable from infinite resolution signals in LIGO, this may not be the case in the much more sensitive space-based and third-generation ground-based detectors. It seems likely that the uncertainties associated with current numerical relativity simulations could cause significant residuals when the waveform is used to subtract out signals from future detector data.

381.03 — Universal Stellar Budget for Binary Black Hole Mergers

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The binary black hole mergers seen by LIGO-like gravitational-wave detectors at cosmological distances pose major challenges for the formation mechanisms. We demonstrate a fundamental relation between the binary separation and the available stellar budget in the universe to produce merging black holes. We show the results for the rates derived from the LIGO-Virgo detections as well as the upper-limits imposed on intermediate-mass black holes and black holes in the pair-instability mass-gap. The separation-budget relation from our study provides a robust framework to test all the proposed formation mechanism for binary black holes.

381.05 — Feeding and Feedback on Nuclear and Galactic Scales in the Seyfert 2 Galaxy Mrk 3

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We study the kinematics of the stars, ionized gas, and warm molecular gas in the Seyfert 2 galaxy Mrk 3 on nuclear and galactic scales with Gemini Near-Infrared Field Spectrograph (NIFS) observations, HST archive data, and long-slit spectra from the Apache Point Observatory (APO). The APO spectra confirm our previous suggestion that a galactic-scale gas/dust disk at PA = 129°, offset from the major axis of the host S0 galaxy at PA = 28°, is responsible for the orientation of the extended narrow-line region (ENLR) and its ionized arcs of gas. The disk is fed by an H I tidal stream from a gas-rich spiral galaxy (UGC 3422) that is 100 kpc to the northwest of Mrk 3. The disk is ionized by the AGN to a distance of at least ∼20″ (∼5.4 kpc). On the nuclear scale, the kinematics within at least 320 pc of the supermassive black hole (SMBH) are dominated by outflows with radial velocities up to 1500 km s^{-1} in the ionized gas and 500 km s^{-1} in the warm molecular gas, in a manner that is consistent with in situ heating, ionization, and acceleration of ambient gas to produce the NLR outflows. There is a rotating disk of ionized and warm molecular gas within ∼400 pc of the SMBH that has re-oriented close to the stellar major axis (indicating possible warping) but is counter-rotating with respect to the stellar kinematics, as has been found in several other S0 galaxies with AGN, consistent with the claim of external fueling of these sources.

381.06 — Gemini Near Infrared Spectrograph Distant Quasar Survey: Initial Results

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We present the initial results from the Gemini Near Infrared Spectrograph Distant Quasar Survey (GNIRS-DQS). This survey, which began in 2017, continues to obtain high quality near-infrared spectroscopy of hundreds of Sloan Digital Sky Survey (SDSS) quasars between redshifts of 1.5 and 3.5 in the ~1.0-2.5 μm band. These GNIRS-DQS and SDSS spectra cover principal quasar diagnostic features, namely C IV, Mg II, Hβ, and [O III] emission lines. To this end, we present basic spectral properties of the first 125 GNIRS-DQS quasars. In particular, we focus on systemic redshifts determined primarily from the rest-frame optical emission lines and the respective velocity offsets of prominent rest-frame ultraviolet (UV) emission lines. As has been seen in previous studies, we observe significant systematic blueshifting for UV-based redshift estimates in addition to notable scatter in the velocity offsets. One of our primary goals is to arrive at a prescription to correct these offsets and minimize the uncertainties on UV-based redshift estimates. This work is supported by National Science Foundation grants AST-1815281 and AST-1815645.

iPoster-Plus Session 385 — Sun, Solar System, Milky Way

385.01 — A new view of the solar atmosphere: daily full-disk multifrequency radio images from EOVSA

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A new pipeline processing system is producing unprecedented daily full-disk images of the Sun from the Expanded Owens Valley Solar Array (EOVSA) in 6 frequency bands from 1-14 GHz. The images are produced by fitting a disk model to the measured visibilities and using the disk for self-calibration of the radio imaging data, resulting in images that faithfully show even the weakest of features in the solar atmosphere, including clear limb brightening, coronal holes, weak plage regions, filaments, and prominences. The multi-frequency data can be used to investigate the physical properties of these features of the solar corona, transition region, and upper chromosphere, but the data are so new that the interpretation is still in progress. We highlight some initial results on the frequency dependence of equatorial limb brightening and polar coronal hole darkening.

385.02 — Contribution of Electromagnetism to the Saturn Rings Origin & Stability

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Here we try to demonstrate how rings of Saturn may be originated from the protoplanetary particles moving around the planet on chaotic orbits after the appearance of the planetary magnetic field due to electromagnetic phenomena. Because of diamagnetism and superconductivity of the iced particles all their chaotic orbits gradually moved to the magnetic equator plane and formed a sombrero disk of the rings and gaps, similar to iron particles that form such shape around a magnet on a laboratory table. Iced particles of the rings are separated from each other by the magnetic field expulsed from them. Eventually each particle is locked within a three-dimensional magnetic well, including due to Abrikosov quantum vortex phenomenon. This mechanism is valid even if particles may have a small fraction of superconductor. Besides defragmentation due to the gravity of the Titan size ice body coming to the Saturn, collision-generated debris of the current moon and meteorites a definite contribution to the rings matter also may come from the frozen water particles generated from the Saturn sputniks geysers due to magnetic coupling between planet and satellites, and that may even create a new ring. It follows that the rings were created in the early time of the appearance of the magnetic field of Saturn.