

Thursday, Feb 14, 2013 at 1:00pm Where: Cavalry Building (CGWA conference room)

Title: Measurement of Coating Material Properties for the Improvement of Gravitational Wave Detectors Presented by: Matt Abernathy

The sensitivity of interferometric gravitational wave detectors is limited by the Brownian thermal noise from the optical mirror coatings used in the detector. Predicting and reducing this noise source requires good knowledge of the coating mechanical properties; including the Young's modulus, Poisson's ratio, mechanical loss angle, and thermal expansion coefficient. This talk explains the importance of knowing these values and describes some recent measurements.

Friday, March 1, 2013 at 1:00pm Where: Cavalry Building (CGWA conference room)

Title: The Yearn to Burn and Plasma; Research in Controlled Fusion Presented by: Herbert L. Berk, Dept. of Physics and Institute of Fusion Studies University of Texas at Austin, Austin, Texas

The ITER project is an international collaboration of many nations that have established advanced and even emerging technologies in their societies. The project aim is to develop nuclear fusion as an energy source that can be the long term solution to society's energy needs. The project is centered in Cadarache, France (near Marseilles). It is scheduled to begin experiments at the end of this decade on the ITER tokamak, now under constructions. This talk we describe the basic physics issues that support the fusion concept and explain why the tokamak concept has been chosen as the vehicle to achieve controlled fusion. Basic questions and research directions to support the development of fusion in ITER and in general, will be discussed as well.

Friday, April 5, 2013 at 1:00pm Where: Cavalry Building (CGWA conference room)

Title: A Radio LSST: Duplicating the VLA for Continuous, sub-GHz Observations with LOBO Presented by: Namir Kassim, Naval Research Laboratory

Before introducing the LOw Band Observatory (LOBO) concept, I will review the history of low frequencies on the Very Large Array (VLA) and examples of low frequency science. Then I will describe LOBO, a proposed, dedicated, radio synoptic, high-z spectroscopy, and real time transient and ionospheric monitoring capability of the VLA. It will make use of the primary focus feeds to observe in parallel with the higher frequency, Cassegrain feeds. LOBO will have dedicated samplers, fiber transmission, and back end processing systems, the latter to include correlator and pipelined calibration, imaging, and publicly accessible archive systems. With a ≥ 5 deg² field of view at P band frequencies and below, LOBO will perform efficient, blind searches for non- thermal transients and high-redshift spectral lines, e.g. by surveying 64 Mpc² at $z \sim 4$ at 330 MHz in each field the VLA visits. LOBO will provide synoptic, wide-field continuum images of all targeted VLA fields, annually surveying over 25% of the available sky. As a natural byproduct of astronomical calibration, LOBO will also provide real-time monitoring of ionospheric turbulence and waves at an accuracy exceeding GPS. By leveraging a $\sim 1/2$ billion-dollar capital investment for fractions of pennies on the dollar, LOBO will transparently leverage the world's most powerful cmwavelength telescope for the burgeoning field of low frequency radio

astronomy and HF/VHF ionospheric remote sensing, in bold defiance of an era of seemingly unavoidable austerity.

Friday, April 19 2013 at 1:00pm Where:Cavalry Building (CGWA conference room)

Title: Nuclear Physics at Two Kiloparsecs with Millisecond Pulsars Presented by: Scott Ransom, NRAO-Charlottesville and University of Virginia

The central densities of neutron stars are the highest known in the Universe, so measurements probing the interiors of radio pulsars, or even their overall mass and radii, can give us unique insights into the physics of matter at extreme densities. The discovery of several interesting new pulsars as well as improved instrumentation has finally allowed us to start measuring the masses of the rapidly spinning millisecond pulsars. These systems have had potentially substantial amounts of mass accreted onto them in the past and are likely more massive, on average, than "canonical" 1.4 Msun neutron stars. Relativistic Shapiro Delay has been used to make very precise measurements of 1.67 and 1.97 Msun neutron stars in the past few years. These systems strongly constrain the equation of state of nuclear matter and a variety of other topics in physics/astrophysics. Finally, I'll show that there is good potential for more measurements in the near future.

Friday, April 26 2013 at 1:00pm Where:Cavalry Building (CGWA conference room)

Title: Reactive Vaporization of Materials Used in Solid Oxide Fuel Cell Systems

Presented by: Camas Key, Montana State University

Numerous energy-related technologies are being developed to improve upon or replace existing ones, which use chemical energy stored in fossil fuels. The reason for this is two-fold: the rate of fossil fuel consumption exceeds the rate at which they are produced naturally, and global fossil fuel consumption negatively impacts the environment. Fuel cells are one example of this technological trend and are desirable because they directly convert chemical energy into electricity leading to exceptionally high efficiencies.

So why has nearly every fuel cell company failed? Practical devices cost too much for their operational lifetime. Degradation mechanisms include but are not limited to: fuel impurities, thermal expansion mismatch between adjoining cell components, segregation and subsequent diffusion of impurities to electrochemically active regions, catalyst agglomeration, interfacial spallation, failure of hermetic seals, and reactive vaporization of cell components. In high temperature (600-1000°C) solid oxide fuel cells vapor species arise from almost every cell component. Several of the most detrimental vapors have been investigated extensively to help understand and minimize the deleterious effects they have on cell performance. Experimental findings from vapor measurements performed at Montana State University will be presented.

Friday, May 10 2013 at 1:00pm Where:Cavalry Building (CGWA conference room)

Title: Characterization and Implementation of Hardware for aLIGO Photon Calibration Presented by:Gregorio Tellez, Physics Dept. UTB

To induce calibrated displacements of the interferometer test masses, the photon calibrator in Advanced LIGO uses a power modulated 2W laser which induces a small displacement that is proportional to the amount of photons that arrive at each End Test Mass (ETM). Each of the excitations that the Pcal induces can be seen as calibration lines in the interferometer readout. In order to ensure that the calibrated displacement is of a single-tone at a desired frequency, with controlled power modulation and maximum power efficiency, a vast amount of tasks have been realized to perform a full characterization of the system components before the commissioning of such subsystem in aLIGO. This talk will detail such efforts made on hardware characterization and implementation for the aLIGO Photon Calibration. An update is given regarding implementation and comparison of previous generation Photon Calibrators and the inclusion of a so-called Optical Follower Servo (OFS) to achieve suppression of displacement noise, from the Pcal, in the gravitational wave detection band.

Friday, Oct 18, 2013 at 2:00pm Where: Cavalry Building (CGWA conference room)

Title: A new search approach for the detection of gravitational-waves from low-mass inspiralling compact binaries with spin Presented by: Nairwita Mazumder, Indian Institute of Science Education and Research-Thiruvananthpuram

The coalescence of binary neutron stars or black hole-neutron star binaries is one of the most promising sources of gravitational waves for ground-based laser interferometric detectors. The merger of these systems is also the promising candidate for short-hard gamma ray bursts and possible source of strong transient electromagnetic emission. By the end of the decade the international network of laser interferometers is expected to make the first direct detection of gravitational waves from coalescing compact binaries. For the detection, however, theoretical predictions are necessary and it will require overcoming a variety of experimental and theoretical challenges. In this talk, I will discuss why spin cannot be ignored for detection of gravitational waves from low mass inspiralling compact binaries with spin and how we can partially handle the challenges involved in the spinning search with the new search template bank.

Tuesday, October 29, 2013 at 3:00pm Where: Cavalry Building (CGWA conference room)

Title: Galaxy Evolution, early stages of galaxy formation in Lyman Alpha emitters Presented by: Tania Peñuela, Ludwig-Maximilians-Universitat (LMU) Munich and Institute for Astronomy of the Swiss Institute of Technology

One of the most common methods of detecting star-forming galaxies in the early universe is to select those with high Lyman-alpha emission. In these galaxies hot and shortlived stars of type O and B produce large amounts of UV photons ionizing the surrounding gas. The Ly-alpha line is thus a powerful tool and estimator for searches of the high-redshift universe as at redshifts more than 2, where the emission is detectable in the optical and IR bands. I will discuss about the formation, morphologies and

characteristics of these type of "primordial" galaxies which could be, in principle, progenitors of milky way type of galaxies.

Tuesday, Nov. 12, 2013 at 3:00pm Where: Cavalry Building (CGWA conference room)

Title: Image analysis pipeline for circumpolar observations

Presented by: Samanta Fuentes-Tapia, University of Texas at Brownsville

Scientists put to test their physical limits in order to pursue knowledge, they go to far away places just to wander at new sights that may bring them more questions and hopefully answers. But how to prepare to all things that can go wrong under extreme conditions? when all your surrounding is against you, not only you may suffer, but also your data. In this talk I will present a basic pipeline created to analyze images from CSTAR, a telescope in Antarctica which has been observing the South Celestial Pole since the austral polar winter of 2008. This pipeline has been created targeting the issues related to the CSTAR observations and data collected, but it can serve as base for any set of raw images which have a celestial pole in its field of view.

Tuesday, Nov. 19, 2013 at 3:00pm Where: Cavalry Building (CGWA conference room)

Title: Cataclysmic Variables in the Kepler Field Presented by: Matt Wood, Texas A&M Commerce

Cataclysmic variable (CV) systems are mass transfer binary star systems with white dwarf primaries, low-mass main sequence secondaries, and an accretion disk that typically provides most of the system luminosity. I will discuss the highlights of the science results obtained from Kepler satellite observations and smoothed particle hydrodynamics (SPH) simulations of CV accretion disks. The systems V344 Lyr, V1504 Cyg, and MV Lyr have been observed by the Kepler instrument at a 1-min cadence since 2009 June 20, and as a result are now the CVs with the best time-series data in history. The first two of these systems are rich in their behavior and promise to be touchstones for CV studies for the foreseeable future. The Kepler data and SPH models reveal that two physical sources yield positive superhumps: viscous dissipation within the periodically flexing disk, and the signal generated as the accretion stream bright spot sweeps around the rim of the non-axisymmetric disk. The V344 Lyr and V1504 Cyg data also reveal negative superhumps arising from accretion onto a tilted disk precessing in the retrograde direction. The changing negative superhump period results from a changing precession rate, which in turn results from a changing mass distribution within the disk. The eclipsing system V447 Lyr shows evidence for a larger disk during outburst and outburst orbital humps. These and other highlights of the Kepler cataclysmic variable data will be discussed.