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# 国台学术报告 NAOC COLLOQUIUM

## 2016 年 第 13 次 / No. 13 2016

**Time: Wed. 2:30 PM, May 11 Location: A135, NAOC**

## Testing Einstein's Equivalence Principle with Cosmic Transients


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**Purple Mountain Observatory**


Dr. Wu is a theoretical astrophysicist. He got his B.S. (2000) and PhD. (2005) from Nanjing University. Dr. Wu visited Caltech from December, 2006 to January, 2008. After that, he moved to Prof. Peter Meszaros's group at Pennsylvania State University, working as a posdtoc research associate until March, 2010. From April 2010, he took the postdoc position in Prof. Bing Zhang's group at University of Nevada, Las Vegas. In May of 2011, supported by the CAS one-hundred-talent program, he joined Purple Mountain Observatory as a research professor. Now, he is the leader of the high energy time-domain astronomy group at PMO.

Dr. Wu's research fields include high energy astrophysics, time domain astronomy, and cosmology. He is interested in all the high energy astrophysical sources, such as gamma-ray bursts and supernovae, focusing on the (magneto-) hydrodynamics, relativistic or non-relativistic shock waves, accretion and outflow, radiation processes in these spectacular phenomena, and the physical nature of their remnants. He is also interested in using astronomical data to probe the Universe (dark matter and dark energy), as well as to test fundamental physics (Lorentz invariance, equivalence principle, etc.). In 2013, he began to work on theoretical research on the electro-magnetic signatures of gravitational wave events and physical origin of fast radio bursts. Dr. Wu was the member of the science teams of the Swift satellite and the Fermi telescope. He is also involved with several Chinese astronomical missions, such as SVOM, Einstein Probe, POLAR, eXTP, HERD, PANGU, etc.

## Abstract


The Einstein equivalence principle (EEP) is an important foundation of general relativity and many other metric theories of gravity. At the post-Newtonian level, the accuracy of the EEP can be tested through the numerical values of the parametrized post-Newtonian (PPN) parameters, such as the parameter $\gamma$. Specifically, the EEP accuracy can be constrained by comparing the $\gamma$ values for different kinds of particles, or for the same kind of particle with different energies, since all gravity theories satisfying the EEP predict the same $\gamma$ values for different test particles. There are a few precise tests of the EEP using constraints on the differences of the $\gamma$ values of different tested particles. Among the most famous are the measurements of the time delay of the photons and neutrinos radiated from supernova 1987A in the Large Magellanic Cloud. In this talk, I will show you that the EEP can also be tested using the time delay of particles such as photons, neutrinos and gravitons with different energies arising in cosmic transients, such as gamma-ray bursts (GRBs), fast radio bursts (FRBs), TeV blazar flares, gravitational wave events. I will also talk about our recent work on the constraints of the photon mass with the same time delays in GRBs and FRBs.


*All are welcome! Tea, coffee, biscuits will be served at 2:15 PM.*