



Contribution ID: 56

Type: **Invited**

Recent developments in gravitational wave science

Tuesday 5 December 2017 16:35 (30 minutes)

Recently, the LIGO Virgo Collaboration achieved the first detections of a gravitational waves. A century after the fundamental predictions of Einstein, we report the first direct observations of binary black hole systems merging to form single black holes. The detected waveforms match the predictions of general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. These observations demonstrate the existence of binary stellar-mass black hole systems. Our observations provide unique access to the properties of space-time at extreme curvatures: the strong-field, and high velocity regime. It allows unprecedented tests of general relativity for the nonlinear dynamics of highly disturbed black holes. Last month, the first detection of gravitational waves from the merger of a binary neutron star was reported. This event was also observed by thousands of scientists by using conventional astronomy. We now have realized a global gravitational wave network that allows interdisciplinary studies in (fundamental) physics, astrophysics, astronomy, cosmology and nuclear physics.

The scientific impact of the recent detections will be explained. In addition key technological aspects will be addressed. Attention is paid to Advanced Virgo, the European detector near Pisa, which recently come on-line. The lecture will close with a discussion of the largest challenges in the field, including plans for a detector in space (LISA), and Einstein Telescope (ET), a large underground observatory for gravitational waves science.

Author: VAN DEN BRAND, Jo (Nikhef)

Presenter: VAN DEN BRAND, Jo (Nikhef)

Session Classification: Session 4