22nd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

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ULTRASAT – THE ULTRAVIOLET TRANSIENT ASTRONOMY SATELLITE

Abstract

ULTRASAT is a scientific mini-satellite carrying a telescope with an unprecedentedly large field of view (210 squared degrees) observing in the ultraviolet (220-280 nm,UV), that is proposed by an Israeli/US collaboration to be constructed and launched to near geostationary orbit by 2020/21. The wide field of view and the advanced UV detectors will enable the discovery and monitoring of transient sources within a cosmic volume 300 times larger than that of the most powerful UV satellite to date, GALEX, thus revolutionizing our understanding of the transient UV universe.

ULTRASAT will be able to vastly expand our knowledge about massive star explosions (Supernova) by measuring the early UV emission from hundreds of events, revealing key physical parameters of the exploding progenitor stars. It will also measure the masses and the environments of supermassive black

holes in the centers of galaxies, as well as characterize known classes of variable objects, such as active galactic nuclei, variable stars and search for planets around white dwarf stars.

ULTRASAT will detect the UV emission from many tens of tidal-disruption events in which stars are "swallowed" by massive black holes near galactic nuclei and enable a measurement of the rate of such events. The overlap of such a wide-field UV mission with existing and planned gravitational-wave and high-energy neutrino telescopes makes it especially timely, enabling the possible identification of the sources of gravitational-waves and high-energy neutrinos. The satellite will provide real-time alerts about newly discovered transient events to the global community enabling valuable multi-wavelength follow up observations.

The ULTRASAT initiative, currently in early development (pre Phase A), has been proposed as a partnership mission of opportunity with ISA (Israeli Space Agency) and NASA via the SMEX Program in 2015, in an attempt by Weizmann Institute and Caltech scientists together with JPL (Jet Propulsion Labs) and IAI (Israeli Aerospace Industries) to demonstrate that cutting edge science can be achieved using satellites which are significantly smaller ($\sim 1m^3$), lighter ($\sim$ 100kg) and cheaper ($\sim 100M\$$, including launch) than most space missions.

The success of ULTRASAT will be a clear and positive demonstration of this concept, and will lead the way to future similar missions.