Contribution ID: **22** Type: **not specified**

GrailQuest & HERMES/SpIRIT: Hunting for GravitationalWave Electromagnetic Counterparts and Probing Space-Time Quantum Foam

Thursday, 4 November 2021 10:20 (20 minutes)

Abstract: GrailQuest (Gamma-ray Astronomy International Laboratory for Quantum Exploration of Space-Time) is an ambitious astrophysical mission concept that uses a fleet of small satellites whose main objective is to search for a dispersion law for light propagation in vacuo. Within Quantum Gravity theories, different models for space-time quantization predict relative discrepancies of the speed of photons w.r.t. the speed of light that depend on the ratio of the photon energy to
the Planck energy. This ratio is as small as 10^-23 for photons in the gamma ray band (100 keV). Therefore, to detect this effect, light must propagate over enormous distances and the experiment must have extraordinary sensitivity. Gamma-Ray
Bursts, occurring at cosmological distances, could be used to detect this tiny signature of space-time granularity. This can be obtained by coherently combine a huge number of small instruments distributed in space to act as a single detector of
unprecedented effective area. This is the first example of high-energy distributed astronomy: a new concept of modular observatory of huge overall collecting area consisting in a fleet of small satellites in low orbits, with sub-microsecond time
resolution and wide energy band (keV-MeV). The enormous number of collected photons will allow to effectively search these energy dependent delays. Moreover, GrailQuest will allow to perform temporal triangulation of impulsive events with
arc-second positional accuracies: an extraordinarily sensitive X-ray/Gamma all-sky monitor crucial for hunting the elusive electromagnetic counterparts of Gravitational Waves, that will play a paramount role in the future of Multi-messenger Astronomy. A pathfinder of GrailQuest is already under development through the HERMES (High Energy Rapid Modular Ensemble of Satellites) and SpIRIT (Space Industry Responsive Intelligent Thermal Nanosatellite) projects: a fleet of six 3U cube-sats (HERMES) to be launched by the end of 2023 plus one 12U cube-sat (SpIRIT) to be launched by the end of 2022.

Presenter: BURDERI, Luciano (University of Cagliari)

Session Classification: Gravitational waves and multi messenger astronomy: chair M. Giroletti