Abstract Submitted
for the APR21 Meeting of
The American Physical Society

A Probabilistic Approach to Estimating the Unknown Redshifts of BATSE Catalog Long-duration Gamma-Ray Bursts JOSHUA OSBORNE, AMIR SHAHMORADI, University of Texas at Arlington, ROBERT NEMIROFF, Michigan Technological University — Gamma-Ray Bursts (GRBs) are some of the most energetic explosions in the universe, releasing energies on the order of 10^{52} ergs, within a fraction of a second to minutes in the form of gamma rays. To understand the intrinsic properties of these bursts we must first determine the distance at which these bursts occur using what is known as the cosmological redshift. Here we present a purely probabilistic approach to estimating the redshifts of 1366 Long-duration GRBs (LGRBs) as observed by the Burst And Transient Source Experiment (BATSE). This is accomplished through a careful selection and modeling of the 5-dimensional space of redshift and the four intrinsic prompt gamma-ray emission properties: the isotropic 1024ms peak luminosity (L_{iso}), the total isotropic emission (E_{iso}), the spectral peak energy (E_{pz}), as well as the intrinsic duration (T_{90z}), while simultaneously taking into account the affects of the detector mechanism of BATSE and sample incompleteness in our dataset. We make two fundamental assumptions in our work: **1.** LGRBs trace, either exactly or closely, the Cosmic Star Formation Rate and **2.** the joint 4-dimensional distribution of the aforementioned prompt gamma-ray emission properties are well-described by a multivariate log-normal distribution. The results of our work are vastly different from those of other works, likely due to the affects of the detector threshold and sample-incompleteness on shaping the previous phenomenologically-proposed high-energy correlations in the literature.

Joshua Osborne
University of Texas at Arlington

Date submitted: 08 Jan 2021 Electronic form version 1.4