

# Refinement of the Proposed Gamma-Ray Burst Time Delay Model

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This paper is the second instalment in our study of the observed time delay in the arrival times of radio photons emanating from Gamma-ray Bursts (GRBs). The mundane assumption in contemporary physics as to the cause of these ponderous time delays is that they are a result of the photon being endowed with a non-zero mass. While we do not rule out the possibility of a non-zero mass for the photon, our working assumption is that the major cause of these time delays may very well be that these photons are travelling in a rarefied cosmic plasma in which the medium's electrons interact with the electric component of the Photon, thus generating tiny currents that lead to dispersion, hence, a frequency-dependent Speed of Light (FDSL). In the present instalment, we "improve" on the model presented in the first instalment by dropping the assumption that the resultant pairs of these radio photons leave the shock front simultaneously. The new assumption of a non-simultaneous—albeit systematic—emission of these photon pairs allows us to obtain a much more convincing and stronger correlation in the time delay. This new correlation allows us to build a unified model for the four GRBs in our sample using a relative distance correction mechanism. The new unified model allows us to obtain as our most significant result a value for the frequency equivalence of the interstellar medium (ISM)'s conductance  $\nu^* \sim 1.500 \pm 0.009$  Hz and also an independent distance measure to the GRBs where we obtain for our four GRB samples an average distance of:  $\sim 69.40 \pm 0.10$ ,  $40.00 \pm 0.00$ ,  $58.40 \pm 0.40$ , and  $86.00 \pm 1.00$  Mpc, for GRB 030329, 980425, 000418 and 021004 respectively

## Keywords

Gamma-ray bursts (GRB), Photon Mass, Plasma, Time Delay, Fireball Model

**Author:** Mr ABBEY, Godson (Copperbelt University Zambia)

**Co-authors:** Dr SRIVASTAVA, Alok (Copperbelt University Zambia); Prof. NYAMBUYA, Golden (National University of Science & Technology, Bulawayo, Zimbabwe); Dr SIMFUKWE, Joseph (Copperbelt University Zambia); Mr SIMPEMBA, Prosperity (Copperbelt University Zambia); Dr PHIRI, Saul (Copperbelt University Zambia)

**Presenter:** Mr ABBEY, Godson (Copperbelt University Zambia)

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