Propulsion Physics Using the Chameleon Density Model[*]

Glen A. Robertson
NASA-MSFC
Huntsville, AL 35812
glen.a.roberson@nasa.gov; 1-256-544-7102

Abstract. To grow as a space faring race, future spaceflight systems will require a new theory of propulsion. Specifically one that does not require mass ejection without limiting the high thrust necessary to accelerate within or beyond our solar system and return within a normal work period or lifetime. The Chameleon Density Model (CDM) is one such model that could provide new paths in propulsion toward this end. The CDM is based on Chameleon Cosmology a dark matter theory; introduced by Khrouy and Weltman in 2004. Chameleon as it is hidden within known physics, where the Chameleon field represents a scalar field within and about an object; even in the vacuum. The CDM relates to density changes in the Chameleon field, where the density changes are related to matter accelerations within and about an object. These density changes in turn change how an object couples to its environment. Whereby, thrust is achieved by causing a differential in the environmental coupling about an object. As a demonstration to show that the CDM fits within known propulsion physics, this paper uses the model to estimate the thrust from a solid rocket motor. Under the CDM, a solid rocket constitutes a two body system, i.e., the changing density of the rocket and the changing density in the nozzle arising from the accelerated mass. Whereby, the interactions between these systems cause a differential coupling to the local gravity environment of the earth. It is shown that the resulting differential in coupling produces a calculated value for the thrust near equivalent to the conventional thrust model used in Sutton and Ross, *Rocket Propulsion Elements*. Even though imbedded in the equations are the Universe energy scale factor, the reduced Planck mass and the Planck length, which relates the large Universe scale to the subatomic scale.