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AN OPTIMIZED ACCEPTANCE TEST PLAN FOR MICRO AND NANO SATELLITES

Abstract

In current acceptance testing strategies for satellites, there are few test plans that deviate from test standards. Given the shift in interest towards low-cost and shorter production times of micro satellites and larger volumes of production, these test strategies may be placing too much emphasis on ensuring reliability at the expense of cost and time-to-market. This paper proposes a means of choosing a set of functional tests and environmental stress screens (ESS) and their corresponding durations under a specified stress level for optimized program lifecycle cost and testing duration, taking into account the stochastic degradation process defects undergo in environmental stress screening as they precipitate from latent to patent defects. Current ESS research optimizes for a single screen whereas in reality multiple tests and screens are involved in the testing plan of a satellite. The required solution lends itself to a global optimum, yet the introduction of multiple tests and screens with varying durations describes a problem with many local optima. The resulting model formulation and solution will address this problem. Throughout this paper, the proposed method is applied to a case study where multiple identical micro satellites form a constellation. The challenges are explained and results are discussed accordingly with respect to manufacturing time, cost and quality when the proposed method is used.