

# Optimum Test Planning for Heterogeneous Inverse Gaussian Processes

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## Abstract

The heterogeneous inverse Gaussian (IG) process is one of the most popular and most considered degradation models for highly reliable products. One difficulty with heterogeneous IG processes is the lack of analytic expressions for the Fisher information matrix (FIM). Thus, it is a challenge to find an optimum test plan using any information-based criteria with decision variables such as the termination time, the number of measurements and sample size. In this article, the FIM of an IG process with random slopes can be derived explicitly in an algebraic expression to reduce uncertainty caused by the numerical approximation. The  $SD$ - and  $SV$  optimum test plans with/without a cost constraint can be obtained by using a profile optimum plan. Sensitivity analysis is studied to elucidate how optimum planning is influenced by the experimental costs and planning values of the model parameters. The theoretical results are illustrated by numerical simulation and case studies.