

## Standby System with Imperfect Coverage and Repairable Service Station

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### Abstract

This paper analyzes the reliability characteristics of a system with imperfect coverage in which a repairable service station is considered. Failure times of primary and standby units are assumed to follow exponential distributions. With a coverage probability  $c$ , a failed unit is immediately detected and replaced by a standby if one is available. If the failed unit is not detected, the system enters an unsafe failure state and has to be refreshed by a reboot action. When the service station breaks down, it needs repair at a repair device. We present the expression for reliability function  $R_Y(t)$  and mean time to system failure  $MTTF$ . Several cases are analyzed to study the effects of various parameters on the system reliability  $R_Y(t)$  and  $MTTF$ . We also perform the sensitivity analysis of  $R_Y(t)$  and  $MTTF$  with respect to system parameters. Finally, we present an application example to demonstrate the applicability of investigated model.

*Keywords:* Imperfect coverage, service station breaks down, reliability,  $MTTF$ , sensitivity analysis.

### 1. Introduction

To maintain a high level of reliability or availability and keep a stable operating quality in power plants, manufacturing system, network system, and industrial system, the system with warm standbys plays an important role. In such system, when the operating unit breaks down, the defective unit will be detected and replaced by a standby one so that the system can keep running. The perfect detection and recovery from a failure is done with a probability  $c$  which is known as coverage factor. However, the process of system switched from the standby state to the operational state maybe is imperfect, which means that the switch process may be failed. When a failed unit is not detected, it takes some time to be located and cleared. It can return to normal system state by the process of reboot. Besides, in real life, the repair service station may be malfunctioned but can be repaired. Motivated by these situations, this paper studies the