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Cygnus Performance on Five Subcritical Experiments

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The Cygnus Dual Beam Radiographic Facility includes two identical radiographic sources - Cygnus 1 and Cygnus 2. Cygnus is the radiography source used in Subcritical Experiments (SCEs) at the Nevada National Security Site (NNSS). The machine specifications are: Electric - 2.25 MV, 60 kA, 60 ns; Radiation - 4 Rad, 1 mm, 50 ns; Operation - single shot, 2-shots/day. Cygnus has operated at the NNSS since February 2004. In this period, it has participated on five SCE experiments - Armando, Bacchus, Barolo A, Barolo B, and Pollux. SCE projects typically require over a hundred preparatory shots culminating in a single full-fidelity or SCE shot, and typically take over a year for completion. Therefore, SCE shots are high risk and high value making reproducibility and reliability utmost priority. In this regard, major effort is focused on operational performance. A quantitative performance measurement is valuable for tracking and maintaining Cygnus preparedness. In this work, we present a new model for analysis of Cygnus performance. This model uses dose distribution as the basis for calculation of reproducibility and reliability. It will be applied both to long-term (historical) and short-term (readiness) periods for each of the five SCEs.

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