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Rapid Polarization Activity in Optical Communication Systems
DAVID YEVICK, MICHAEL REIMER, GEORGE SOLIMAN, Department of Physics, University of Waterloo — We have recently analyzed the high-speed polarization and polarization-mode-dispersion (PMD) transients associated with mechanical impacts on a dispersion compensation module consisting of several km of optical fiber. These generate in our experiments rotational frequencies of up to several hundred radians/sec on the Poincare sphere that can severely degrade the performance of both standard and non-conventional communications systems. Accordingly, we implemented several procedures for performing high-speed polarization measurements, employed these to analyze small and large amplitude excitations and compared the results with a heuristic fiber model. Theoretically, we extended our previous work on applying the Magnus expansion to the analysis of the dependence of the PMD and polarization-dependent-loss (PDL) on frequency. From these, we obtained simple procedures for modeling polarization behavior over a wide frequency range from a small number of experimental measurements. Finally, we analyzed the applicability of various models of stochastic time-dependent refractive index variations to system outage prediction.

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