

Effect of Brillouin slow light on distributed Brillouin fiber sensors

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Received May 10, 2006; revised June 22, 2006; accepted June 22, 2006;
posted July 3, 2006 (Doc. ID 70732); published August 25, 2006

The effect of Brillouin slow light on distributed Brillouin fiber sensors (DBFSs) is studied. We demonstrate Brillouin slow light for a 1.2 ns pulse with peak powers (P_S) from 3.3 to 56.2 mW on depletion of the pump power (P_P) ranging from 1.3 to 83.2 mW in conventional optical fibers (SMF-28). Experiments show that, when pump power depletion is not negligible, for a given P_P the Brillouin gain and delay time of a pulse decrease when P_S increases in a long (≥ 10 km) sensing fiber. The optimum pump beam depletion resulting from strong interaction of the pump and the probe in the fiber provides accurate temperature and strain information at a high spatial resolution. Our study reveals that at low P_P the spatial resolution error caused by the pulse delay for a DBFS with centimeter spatial resolution is less than 5% of the pulse length. © 2006 Optical Society of America

OCIS codes: 290.5900, 190.5530, 060.5530, 060.2370.