Selected Abstracts from Other Physical Review Journals

Abstracts of papers that are published in other Physical Review journals and may be of interest to Physical Review A readers are printed below.

Nonlinearity of Pancharatnam's geometric phase in polarizing interferometers Bernhard Hils, Wolfgang Dultz, Werner Martienssen *Physikalisches Institut der Universität Frankfurt, Robert-Mayer-Straße 2-4, 60054 Frankfurt-am-Main, Germany* (Received 10 December 1998)

Earlier investigations show a time-variable nonlinear shift of the fringe pattern in a polarizing interferometer while rotating a polarizer at the exit. This effect was identified as Pancharatnam's geometrical phase and proposed for applications in interferometry and fast optical switching devices. A heterodyne analysis attributes moving fringes to a frequency difference between the interfering beams; thus changing fringe velocities point to a dynamic frequency development within the period of the uniformly rotating analyzer. This explanation offends the intuition and we undertake an experimental and theoretical investigation of the effect to solve the paradox. We determine, e.g., the complete frequency and mode spectrum of an arbitrary state of polarization P_0 behind a rotating linear analyzer and behind a rotating arbitrary linear birefringent plate. We find that, in spite of a fast changing phase in the interferometer, no other (higher) frequency components appear in the spectral distribution of the intensity at the exit than the double of the rotary frequency of the analyzer: phase nonlinearities are compensated for by intensity changes. Only a phase-sensitive detector like an array of photodetectors is able to observe the nonlinearity of Pancharatnam's geometrical phase. A single detector only finds a sinusoidal intensity variation. Our insight into these relations leads us to two new applications of Pancharatnam's phase: supersensitivity of a polarizing double beam interferometer with a video camera acting as a phase detector and external tuning of a Fizeau interferometer. [S1063-651X(99)09308-3] [Phys. Rev. E **60**, 2332 (1999)]

Reshaping of femtosecond pulses by the Gouy phase shift Z. L. Horváth and Zs. Bor *Department of Optics and Quantum Electronics, JATE University, P.O. Box 406, H-6701 Szeged, Hungary* (Received 10 November 1998)

It is shown that because of the phase anomaly a femtosecond pulse propagates on the optical axis with a velocity greater than c in the vicinity of the focus not only for large but also small values of the Fresnel number. The group velocity is calculated and its physical meaning discussed. Analytical expressions are derived for the electric field. The causality of the system is proved. The mechanism of the superluminality is a reshaping process caused by the interference. Contrary to other superluminal phenomena, the superluminal propagation occurs in a classically *not* forbidden region. [S1063-651X(99)11108-5] [Phys. Rev. E **60**, 2337 (1999)]

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