

TIME DELAY AND CALABI INVARIANT IN CLASSICAL  
SCATTERING THEORY

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We define, prove the existence and obtain explicit expressions for classical time delay defined in terms of sojourn times for abstract scattering pairs  $(H_0, H)$  on a symplectic manifold. As a by-product, we establish a classical version of the Eisenbud-Wigner formula of quantum mechanics. Using recent results of V. Buslaev and A. Pushnitski on the scattering matrix in Hamiltonian mechanics, we also obtain an explicit expression for the derivative of the Calabi invariant of the Poincaré scattering map. Our results are applied to dispersive Hamiltonians, to a classical particle in a tube and to Hamiltonians on the Poincaré ball.