On the two weight inequality for the Hilbert transform

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ABSTRACT: The two weight inequality for the Hilbert transform arises in the settings of analytic function spaces, operator theory, and spectral theory, and what would be most useful is a characterization in the simplest real-variable terms. We show that the L^2 to L^2 inequality holds if and only if two L^2 to weak-L^2 inequalities hold. This is a corollary to a characterization in terms of a two-weight Poisson inequality, and a pair of testing inequalities on bounded functions. Joint work with Eric Sawyer, Chun-Yun Shen, and Ignacio Uriate-Tuero.