An implicit Euler scheme with non-uniform time discretization for stochastic heat equations

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We present a new algorithm for solving stochastic heat equations on the spatial domain $[0,1]^d$. We derive an error bound, which depends on d, on the number of evaluations of one-dimensional components of the driving Brownian motion W, and on the decay of eigenvalues of the covariance of W. This bound matches known lower bounds that are valid for every algorithm. Hence the new algorithm is asymptotically optimal.