Abstract: Eigenfunction expansion methods have been studied in various ways to study solutions of PDEs. This talk will feature error estimates for approximation of solutions of Laplace’s equation with Dirichlet, Robin or Neumann boundary value conditions using the harmonic Steklov eigenfunctions. Based on the spectral theory of trace spaces the solutions are represented by orthogonal basis from normalized Steklov eigenfunctions. When the region is a rectangle, with explicit formulae for the Steklov eigenfunctions, both theoretical analysis and numerical experiments will introduce the efficiency and accuracy of the Steklov expansion methods in this talk.