

On Discretizations Using Quasi-Polynomial Spaces of Differential Forms

Ludmil T Zikatanov

Department of Mathematics, Penn State

ludmil@psu.edu

Shuonan Wu

School of Mathematical Sciences, Peking University

snwu@math.pku.edu.cn

We consider extensions of the exponentially fitted finite element scheme for convection-diffusion equations of Xu and Zikatanov (1999); at some point Raytcho Lazarov asked whether such schemes extend to tensor valued coefficients. This resulted in the work of Lazarov and Zikatanov (2004), which gave the first relations between exponential fitting and the finite element exterior calculus. We extend this to quasi-polynomial spaces of differential forms with a positive weight and polynomial coefficients. We show that the unisolvent set of functionals for such spaces on a simplex in any spatial dimension is the same as the one used for the polynomial spaces. These results provide tools for studying exponentially fitted discretizations stable for general convection-diffusion problems in Hilbert differential complexes.