

# FA-Toolbox: On some Hilbert complexes, related compact embeddings, ... and more

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(Parts are joint work and lots of discussions  
with Ralf Hiptmair, Clemens Pechstein, Rainer Picard,  
Michael Schomburg, Marcus Waurick, Ragnar Winther, Walter Zulehner)

We investigate some Hilbert complexes, i.e.,

- the classical de Rham complex,
- the elasticity complex,
- and the biharmonic complex.

We show closed ranges, Friedrichs/Poincaré type estimates, Helmholtz type decompositions, regular decompositions, regular potentials, finite cohomology groups, and, most importantly, new compact embedding results. Our results hold for general bounded strong Lipschitz domains of arbitrary topology and rely on a general functional analysis framework (fa-toolbox).

We also demonstrate how to solve PDEs and how to get a posteriori error estimates in this general setting, both in an almost trivial way.

This talk is strongly related to the ones of Michael Schomburg and Walter Zulehner.

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