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The generalized spectra of operators over C^* -algebras

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If A is a C^* -algebra and F is an A -linear, bounded operator on a Hilbert C^* -module over A , then the operators of the form $F - aI$, where a runs over A , give rise to new generalized spectra in A of the operator F . By considering these generalized spectra in C^* -algebras of operators over C^* -algebras instead of ordinary spectra in the field of complex numbers, we obtain generalizations of various results from the classical spectral theory of operators. More precisely, in the classical operator theory, there are several versions of spectra, related to special classes of operators (Fredholm, semi-Fredholm, upper/lower semi-Fredholm, etc.). Replacing these spectra by the generalized spectra in C^* -algebras of operators over C^* -algebras, we show that most relations between these spectra are still true for these generalized versions. The relation between these spectra of an operator and those of its compressions is also transferred to the case of Hilbert C^* -modules. In addition, we consider perturbations of the generalized spectra in C^* -algebras of 2 by 2 operator matrices over C^* -algebras and prove generalizations of various results from the classical spectral theory concerning perturbations of spectra of operator matrices. Finally, we consider also the isolated points of the ordinary spectrum of operators over C^* -algebras and prove a generalization of the classical theorem about Riesz points in the setting of semi-Fredholm operators over C^* -algebras.