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``Spectra of elements in some group rings''

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The analysis of the spectrum of an element of the group ring of $SU(2)$, $SL(2, \mathbb{Z})$, ... under finite dimensional irreducible unitary representations, arises in many contexts (in analysis-the Ruziewicz problem, in combinatorics-expanders, in quantization-semi classical theory). One crucial feature is the apparently difficult problem of a spectral gap. For $SU(2)$ the construction of an element with a spectral gap was first carried out by Drinfeld. We give a general and elementary method for achieving such a gap and discuss some other features of the spectra of such elements. This is joint work with Gamburd and Jakobson.