Operators of spectra relationship in the basis of the complex exponential functions and Vilenkin – Christenson functions

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In this work scientific and applied problem reciprocal spectra is posed and solved for the most well-known and widely used in digital processing bases of complex discrete Fourier exponential functions and Vilenkin – Christenson functions. To this end, the article examines the theoretical basis of the generalized analysis of the spectrum in the data bases, using the scalar and matrix forms of representations of discrete Fourier transforms. For specific values of the dimension data connections and the most used in practice, treatment methods and Paley Hadamard order basis functions in Vilenkin – Christenson systems is the structure with the main properties of the matrix interaction operators spectrum on which the original rules for combining the spectra data bases in independent groups are written. With their use a generalized analysis of the spectrum is presented as a systems of more simple for the practical implementation equation of spectra connections new analytical interpretation of Parseval energy equality in the spectral range of said bases is suggested. The peculiar nature of the identified spectra in the reciprocal Fourier and Vilenkin – Christenson basis gives a clear and useful geometric interpretation. Obtained partial results are generalized to arbitrary dimension discrete signal, which allowed the development of original algorithms reciprocal spectra in the Fourier and Vilenkin – Christenson basis for signals of different shape and length. Particularly useful results can be obtained in solving the problems of signal processing using their spectra and energy characteristics.

Keywords: *basis functions, Vilenkin – Christenson functions, a synthesis of the spectrum, the Fourier kernel.*

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