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OSCILLATORY PHENOMENA FOR HIGHER-ORDER FRACTIONAL LAPLACIANS

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Abstract: We collect some peculiarities of higher-order fractional Laplacians $(-\Delta)^s$, $s > 1$, with special attention to the range $s \in (1, 2)$, which show their oscillatory nature. These include the failure of the polarization and Pólya–Szegő inequalities and the explicit example of a domain with sign-changing first eigenfunction. In spite of these fluctuating behaviours, we prove how the Faber–Krahn inequality still holds for any $s > 1$ in dimension one.

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Key words: polarization inequality, Pólya–Szegő inequality, first eigenfunction, positivity-preserv-ing properties, Faber–Krahn inequality.