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Sign components for general bosonic-fermionic coinvariant rings

We prove the sign-isotypic components of the coinvariant rings $R_n^{(k,j)} \otimes R_n^{(0,1)}$ and $R_n^{(k,j+1)}$ are isomorphic, establishing the hook-components conjecture of F. Bergeron (2024). In the important case of $R_n^{(2,0)} \otimes R_n^{(0,1)}$ and $R_n^{(2,1)}$, this establishes the sign-character component of a conjecture of Zabrocki (2019) on a module for the Delta conjecture, and computes the graded dimensions of the Khovanov–Rozansky homology of the $(n, n+1)$-torus knot. This is based on joint works with Nicolle González, Hanna Mularczyk, and Pablo S. Ocal.