Orthonormal Gaussian polyanalytic functions and white noise spectrograms

We investigate the processes $\{\mathcal{Z}_{f_n}\}_{n=0}^{\infty}$ of zeros of a sequence of Gaussian random functions $\{f_n(z,\overline{z})\}_{n=0}^{\infty}$, orthonormal in expectation, in the sense that

$$\mathbb{E}\left[e^{-|z|^2} f_n(z,\bar{z})\overline{f_{n'}(z,\bar{z})}\right] = \delta_{nn\prime},$$

and arising from the Gaussian Entire Function (GEF),

$$f_0(z) := \sum_{k=0}^{\infty} \zeta_k \frac{z^k}{\sqrt{k!}}, \quad \zeta_k \sim N_{\mathbb{C}}(0,1) \text{ i.i.d}$$

by n iterations of the Landau levels raising operator, $\nabla_z^{\uparrow} = \partial_z - \overline{z}$, with emphasis on interactions between different Landau Levels. The results provide information about the zeros of white noise spectrograms with Hermite windows.