Sampling via Generating Functions

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***Abstract*—We develop connections between some of the most powerful theories in analysis, tying the Shannon sampling formula to Cauchy's integral and residue formulae, Jacobi interpolation, and Levin's sine-type functions. The techniques use tools from complex analysis, and in particular, the Cauchy theory and the theory of entire functions, to realize sampling sets Λ as zero sets of well-chosen entire functions (sampling set *generating functions*). We then reconstruct the signal from the set of samples using the Cauchy-Jacobi machinery. These methods give us powerful tools for creating a variety of general sampling formulae, e.g., allowing us to derive Shannon sampling and Papoulis generalized sampling via Cauchy theory and sampling in radial domains.**