Sampling via Generating Functions

***Abstract*—We develop connections between some of the most powerful theories in analysis, tying the Shannon sampling formula to the Poisson summation formula, 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.**