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Weakly multiplicative distributions and weighted Dirichlet spaces

We show that if u is a compactly supported distribution on the complex plane such that, for every pair of entire functions f, g,

$$\langle u, f\overline{g}\rangle = \langle u, f\rangle\langle u, \overline{g}\rangle,$$

then u is supported at a single point. As an application, we complete the classification of all weighted Dirichlet spaces on the unit disk that are de Branges–Rovnyak spaces by showing that, for such spaces, the weight is necessarily a superharmonic function. (Joint work with Javad Mashreghi.)