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# SOME EQUILIBRIUM PROBLEMS WITH APPLICATIONS IN APPROXIMATION THEORY

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The equilibrium problems in the presence of external fields have a number of applications in several problems in approximation theory; in particular, in the asymptotic study of orthogonal and Heine-Stieltjes polynomials .

Namely, given a closed set  $\Sigma \subset \mathbb{C}$  and an admissible external field (in the "Saff-Totik sense" [1])  $\varphi$  on  $\Sigma$ , the equilibrium measure of  $\Sigma$  in the presence of  $\varphi$  is the unique unit measure  $\mu_\varphi$  with support  $\text{supp } \mu_\varphi \subset \Sigma$  for which the infimum of

$$I_\varphi(\sigma) = - \int \int \log |x - z| d\sigma(x) d\sigma(z) + 2 \int \varphi(x) d\sigma(x)$$

is attained. Moreover,  $\text{supp } \mu_\varphi$  is a compact subset of  $\Sigma$ . But in general it is a difficult task to determine  $\text{supp } \mu_\varphi$ .

In this talk we discuss some simple cases of particular importance in the applications.

## References

- [1] E.B. SAFF AND V. TOTIK, *Logarithmic Potentials with External Fields*, volume 316 of *Grundlehren der Mathematischen Wissenschaften* (Springer-Verlag, Berlin, 1997).