1135-47-1235 **Joseph A Ball*** (joball@math.vt.edu), Department of Mathematics, Virginia Tech, 225 Stanger Street, Blacksburg, VA 24061. *A Positivstellensatz for free noncommutative kernels.*

A **free nc kernel** is a function K of two matrix d-tuple arguments $Z = (Z_1, \ldots, Z_d)$ and $W = (W_1, \ldots, W_d)$ (with each Z_i say of size $n \times n$ and each W_i of size $m \times m$) coming from some domain Ω with values in the space $\mathcal{L}(\mathcal{A}^{n\times m}, \mathcal{B}^{n\times m})$ with $\mathcal{A}$ and $\mathcal{B}$ two given C^*-algebras (here d is fixed while n and m are arbitrary), subject to some additional compatibility conditions. Such a kernel K is said te bo **completely positive** (**cp**) if the $K(Z,Z)$ is a completely positive map for each $Z \in \Omega$. A **Positivstellensatz for free nc kernels** for a given pair of such kernels $\mathfrak{Q}\colon \Omega \times \Omega \to \mathcal{L}(\mathcal{A}, \mathcal{L}(\mathcal{S}))_{\rm nc}$ and $\mathfrak{S}\colon \Omega \times \Omega \to \mathcal{L}(\mathcal{A}, \mathcal{L}(\mathcal{Y}))_{\rm nc}$ is to obtain a **certificate** for when it is the case that $\mathfrak{Q}(Z,Z)(I) \succ 0 \Rightarrow \mathfrak{S}(Z,Z)(I) \succeq 0$. The talk will discuss the present status of this this problem as well as its connections with free nc Nevanlinna-Pick interpolation and with other Positivstellensätze. (Received September 20, 2017)