1154-47-1626 **Joseph A. Ball***, joball@math.vt.edu, **Gregory Marx**, marxg@vt.edu, and **Victor Vinnikov**, vinnikov@cs.bgu.ac.il. *Jordan decomposition for free noncommutative kernels.* Preliminary report.

A *completely positive (cp) kernel* on Ω to $\mathcal{L}(\mathcal{A}, \mathcal{L}(\mathcal{Y}))$ (bounded linear operators from the C^*-algebra $\mathcal{A}$ to bounded linear operators on the Hilbert space $\mathcal{Y}$) in the sense of Barreto-Bhat-Liebscher-Skeide is a function $k\colon \Omega \times \Omega \to \mathcal{L}(\mathcal{A}, \mathcal{L}(\mathcal{Y}))$ which satisfies the cp condition: $\sum_{i,j=1}^{N} y_i^* k(\omega_i, \omega_j)(a_i^* a_j) y_j \geq 0$ for all ω_i's in Ω, a_i's in $\mathcal{A}$, y_i's in $\mathcal{Y}$ for $i = 1, \dots, N$, $N = 1, 2, \dots$. A *free noncommutative (nc) cp kernel* is a quantized version of the BBLS cp kernel, whereby one allows the point set to include matrices over the level-1 set of points Ω and demands that the kernel function respect direct sums and similarities via complex matrices for the matrix-point arguments in a natural way. When one drops the cp condition on such a kernel K, one is led to the notion of free nc kernel. We show that any free nc kernel over a finite point set Ω has a Jordan decomposition, i.e., one can write the kernel as a four-fold linear combination of completely positive kernels. (Received September 16, 2019)