

## ON THE ENTANGLED ERGODIC THEOREM

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ABSTRACT. We discuss the Entangled Ergodic Theorem for certain relevant situations, that is the convergence in the strong, or merely weak operator topology of the Cesaro mean

$$\frac{1}{N^k} \sum_{n_1, \dots, n_k=0}^{N-1} U^{n_{\alpha(1)}} A_1 U^{n_{\alpha(2)}} \dots U^{n_{\alpha(m-1)}} A_{m-1} U^{n_{\alpha(m)}}.$$

Here  $U$  is a unitary operator acting on the Hilbert space  $\mathcal{H}$ ,  $A_1, \dots, A_{m-1}$  are bounded operators acting on  $\mathcal{H}$ , and  $\alpha : \{1, \dots, m\} \mapsto \{1, \dots, k\}$  is a partition of the set  $\{1, \dots, m\}$  in  $k$  parts. The situations of interest will be the case when the  $A_j$  are compact, without any condition on the spectrum of  $U$ , the case when  $U$  is almost periodic without any condition on the  $A_j$ , and finally a case arising from "quantum diagonal measures".

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