

## High Energy Physics - Theory

# Nambu Quantum Mechanics on Discrete 3-Tori

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We propose a quantization of linear, volume preserving, maps on the discrete and finite 3-torus  $T_N^3$  represented by elements of the group  $SL(3, \mathbb{Z}_N)$ . These flows can be considered as special motions of the Nambu dynamics (linear Nambu flows) in the three dimensional toroidal phase space and are characterized by invariant vectors,  $a$ , of  $T_N^3$ . We quantize all such flows which are necessarily restricted on a planar two-dimensional phase space, embedded in the 3-torus, transverse to the vector  $a$ . The corresponding maps belong to the little group of the vector  $a$  in  $SL(3, \mathbb{Z}_N)$  which is an  $SL(2, \mathbb{Z}_N)$  subgroup. The associated linear Nambu maps are generated by a pair of linear and quadratic Hamiltonians (Clebsch-Monge potentials of the flow) and the corresponding quantum maps, realize the metaplectic representation of  $SL(3, \mathbb{Z}_N)$  on the discrete group of three dimensional magnetic translations i.e. the non-commutative 3-torus with deformation parameter the  $N$ -th root of unity. Other potential applications of our construction are related to the quantization of deterministic chaos in turbulent maps as well as to quantum tomography of three dimensional objects.

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