1067-Z1-1266 **Stephen R Muir*** (srm0070@unt.edu), Stephen Muir, Department of Mathematics, 1155 Union Circle #311430, Denton, TX 76203. *Gibbs Measures for Unbounded Local Energy Functions on* $\mathbb{N}^{\mathbb{Z}^d}$.

In statistical mechanics, the metric space $\mathbb{N}^{\mathbb{Z}^d}$ serves as a classical lattice model with a countable infinity of possible states at each lattice site. We introduce a definition of Gibbs state(probability measure) for suitable functions $f : \mathbb{N}^{\mathbb{Z}^d} \to \mathbb{R}$, which play the role of negative *local energies*, i.e. specific internal energies. We emphasize that we work solely with a local energy function and need no reference to an interaction potential. Conditions on f ($(d-1)$-*regularity* and *exp-summability*) are provided which guarantee the Gibbs states for f to be a nonempty, compact(weak topology), convex set of measures. We characterize them as exactly those probability meausres that obey a local-energy version of the famous DLR(Dobrushin-Lanford-Ruelle) equations. We show too that the variational characterization holds: shift invariant Gibbs states are precisely the states maximizing the negative free energy functional. For the smoother class of d-regular exp-summable functions we can show, c.f. H.O. Georgii, how to convert to an equivalent system consisting of a finite measure and strongly summable interaction potential, which is the standard starting point in the literature. (Received September 20, 2010)